MODEL AIRPLANE NEWS

FEBRUARY 1950 · 25 CENTS

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By BILL WINTER

IN THIS hobby and business of ours there are a few methodical people who don't like to guess at the answers. Off hand, we can think of three interesting cases where competent people have maintained statistics on one phase or another of the model airplane activity.

First, there is M. J. Thomas, of Pittsburgh, he of the fog-horn voice, and perennial announcer of the Nationals radio-control event. Comparatively few industry members seem to know what they should about M.J.'s background. For many years, M.J. has been a guiding light in the Pittsburgh school model plane program. Not only does he know from bitter experience how to sell modeling as an activity in the schools, its limitations and its advantages, but he has kept an amazing record of various plane projects that show precise results, hence difficulty levels, in every operation from sticking a hook on a stick to laying down a fuselage side.

Back at the Chicago Nationals before the war, we sat up one night with M.J. looking over clippings (was it the PITTSBURGH PRESS?) of graded models that had appeared in the papers. And since then we have followed this man's efforts with the younger kids. At Monticello he showed us precisely kept charts and records that revealed the exact results of exposing various age youngsters to various types of beginners projects, showing their relative success or failure with every operation in finishing one of the designs.

Then there is Frank Greene who apparently keeps tabs on thousands of model flights. Off hand, he can tell you just how long a given size model with a given class engine can be expected to stay up—on the average, of course. Information like this is more than a curiosity. When the boys get to talking about rules changes, and opinions and facts cannot be separated, this Greene man can tell you whether a .199 job is a match for a .60 and, if it isn't, exactly how far it falls short. Facts can be startling as we all well remember when Frank Nekimken, another guy who likes precise answers better than mere impressions, maintained detailed records of the 1947 Nationals, showing numbers of entrants who flew in every event, the numbers of flights, and so on. The results showed that the most popular event was rubber-stick, and that several classes of free flight ranked well ahead of U-control that year.

And this brings us to Harry Copeland, of Syracuse, N.Y., who has been interested in the welfare of the Beginners and the Juniors. Several months ago the *"Scrap Box"* promised a report on the facts and figures amassed by Copeland over the past contest seasons. Before us is a loose-leaf notebook, each page protected by cellophane, with charts and bar graphs, the latter done in various colors, bearing the title "Statistics AMA Sanctioned Meets from 1942 to 1949."

The charts give figures on various meets, converted to percentages when necessary to make comparisons. You can read how many registrations were made at any meet, and how many of these were made in advance, and how many on the field. Over a period of time, advance and on-field registrations seem to boil down to a 50-50 split. You can also find the number of entrants in any event, Junior, Senior, or Open. Now what got us into this discussion was Harry's observations on the dwindling fortunes of the youngest class.

Let's take rubber-powered stick as a starter. Beginning with the August 9, 1942, Meet and ending with July 17, 1949, Meet at Watertown, there is a series of ten bar graphs, each bar broken down into portions that indicate at a glance how many Juniors, Seniors, and oldsters competed. Early in the war, Juniors predominated. (Sure, there was a draft, but where are the beginners today?) In that August 9, 1942, Meet, Juniors were 40%, Seniors 20%, and Open 40%. In 1946 this had changed to 9.6% Juniors, 28.5% Seniors, and 61.9% Open. This year it was 8.3% Juniors, 25% Seniors, and 66.6% Open. Rubber-power cabin is even worse with 6.9% Juniors today, as against 20.7% Seniors, and 72.4 Open.

Hand-launched gliders stood up pretty well until this year when the Junior element tumbled from a sturdy 41.6% in 1946, to a small 13% in 1949. Seniors were but 17% but Open a whopping 70% this year.

Towline glider is the same story. Only 13.3% Juniors this year, against 26.7% Seniors, and 60% Open. Free-flight gas began poorly for the Juniors in 1942 with but 12%, against an even split of Seniors and old men, then worked up nicely to 30% in 1945, but finally deflated to 4.4% in 1948, and 10.1% in 1949. Seniors stand now at 43.4 and Open at 52.2%. Controline is wicked; speed and stunt combined are squeezing the Beginner class down steadily (figures from 1947 on) to a scant 5.5% for the Beginner or Junior this year, against a rather small 18.5% in Senior and a rocking 76% for the

(*Continued on page 5*)

LEONARD WIECZOREK

Our *"Plane of the Month"* three-view artist started his modeling career back in 1930 when he took up the construction of flying rubber scale models. He was soon designing his own models and had plans of these in several magazines, finally reaching the columns of M.A.N. in 1940. Studied mechanics and engineering in California, but this was interrupted when he went into pilot training with the Air Force. After the war, he resumed engineering study in New York City; then left for Bell Aircraft where he is a Tool Engineer. Still keeps his hand in modeling though, mainly in his original line of flying scale models.

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HOWARD G. McENTEE ..... Editor
WITTICH D. HOLLOWAY ..... Art Director

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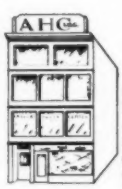

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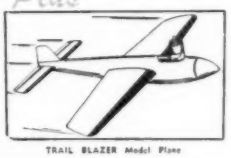

TRAIL BLAZER Model Plane

TRAIL BLAZER Model Plane with carved lower fuselage-half, fully formed aluminum upper half. Balsa sheet wing, no frames used. Balsa tail surfaces, plywood engine mount. Schematic drawings with step-by-step plans. Rubber wheels, detail paint schemes.

Plus not 75, not 100 but ALL ACCESSORIES including:

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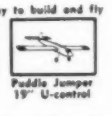
Paddle Jumper 19" U-control

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You get the same accessories listed in our other flying outfits (excluding those not needed in a glo engine, of course!). Everything needed to build and fly planes shown except fuel and starting battery.

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CO-2 FLYING OUTFITS

For the younger set, their Fathers and big brothers, there's nothing like the thrill of CO2 flying. You don't need much space for free-flights - 100 feet square on windless days - and less than a twenty foot circle for tethered flying.

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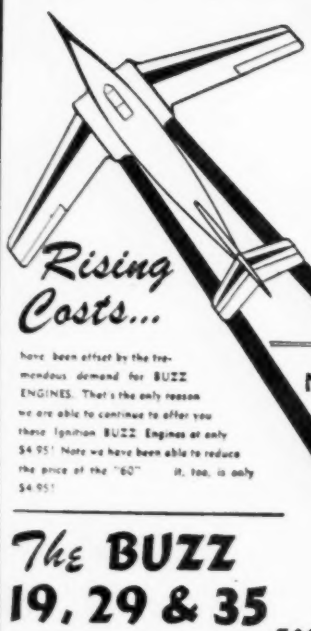

. . . have been produced by popular demand! BUZZ Engines have been used in every type of model flying, U-Control, Free-Flight, Radio Control, and now the same high-quality engines are available as Glo-Engines. These engines are the simple, dependable BUZZ engines that in the past year have been time and field-tested by over 20,000 modelers! You'll enjoy more hours of flying per dollar investment with BUZZ Engines!

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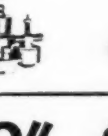

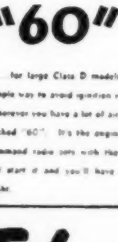

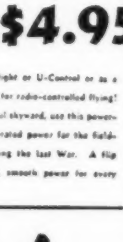

The interchangeable Class A, B and C Buzz Engines in glo-plug operation! The BUZZ 19, 29 & 35 Engines lead the field in low-cost FLYING FUN! Thousands of modelers all over the world depend on the rugged construction and easy starting of BUZZ Engines every day for their FUN in FLYING. Can be interchanged on the field so you can fly the same model in Class A, B or C . . . the crankcase mounting holes are identical.

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. . . for large Class D models in Free-Flight or U-Control or as a simple way to avoid ignition interference for radio-controlled flying! Wherever you have a lot of airplane to haul skyward, use this power-packed "60". It's the engine that generated power for the field-command radio sets with the Army during the last War. A flip will start it and you'll have continuous, smooth power for every flight.

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The BUZZ 19, 29 & 35

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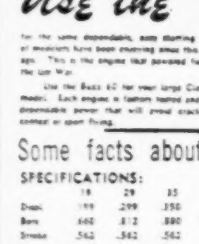

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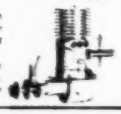

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Scrap Box

(*Continued from page 1*)

old men. A somewhat different set of figures covering New York Statewide Schools Model Airplane Meets, shows that the 13-15 age groups is somewhat predominant, followed closely by 16-17, and a very small percentage for students 17 years and over.

There is little disputing the fact that, in New York State at least, the Beginner and the Junior is disappearing. These youngsters are the lifeblood of the hobby. At least where contests are concerned, the kids are having no part, thank you. We all think controline is the deal for Beginners, but at contests no calculated effort could have a more effective result in killing off the Juniors. The way we run it, controline emphasizes physical skill and bodily coordination and minimizes the luck element. Thank goodness we were unsuccessful in trying to take the luck out of free flight. Thanks, Harry Copeland for these facts.

Looking back on the grand year of 1949 we can't help but realize that what made it such an interesting model year was the wide variety of types of models flown and the variations in power plants. So many of our friends are growing mentally muscle bound on controline only, or free flight only, that the serious side of competitive modeling is spoiling most of their fun. In the rocky pasture out back of our home we have flown this year such varieties of models as a *Jasco Trooper* tow-launch glider, an all-balsa hand-launch glider powered by the new small *Jetex* unit, Wakefield models, small rubber models, an all-balsa R.O.G., various flying scale and original free flights on *Infants*, *Baby Spitfires* and *Cubs*, and a couple of radio jobs. And this should include Jim Walker *Interceptors*, *Hornets*, and hand-launched gliders. There was even some controline work, with a fling at several round-the-pylon novelties and a session on a Goldberg *Trainee* with an *Ohlsson* 23. The local hobby shop dealer—45 miles from here—came up to see some R.C. flying and ended by checking us out in U-control. That *Trainee* sitting out there so beautifully on the end of the lines sure was a thrill for an old-timer. All models are fun—to get the most fun you have to fiddle with all types.

The biggest thrills of the year were simple things. That *Jasco Trooper* for example. Man how those things glide! On a summer's day there's nothing better than watching one of these tow launchers ride the heat waves. The baby engines were also a thrill. Too many people claim they can't fly free flight. No room. Stuff and nonsense! If you have the strength to bend a rudder tab, you can put up a small-engined job for flights up to three and four minutes over a moderate-sized area. One out of three flights can be caught at the finish, sometimes without taking a step. Wind complicates things, but five- and ten-second motor runs still give nice results.

One of the real surprises was a little twin-boom pusher with the tiny *Campus* engine which Editor McEntee dragged out of his car trunk after Yours Truly had finished chopping down trees with a radio model. This little job buzzed around for some two minutes, making perhaps a dozen wide circles. This midget power model certainly impressed us—and it impressed kids, who immediately wanted to swear off gas.

One nice thing about some of these model types is the simplicity of operation. One doesn't need to wear out his brains remembering tools, things to look out for, whether some battery has run down, if there is dirt in the needle valve, and so on, when flying a simple airplane. To fly for fun, things need to be *simple*. To relax and watch you need something that gets into the air without fuss or mechanical side problems. It is too bad that contests have developed such a terrible in-the-rut approach to models.

Has anyone heard anything about the Wakefield? After the virtual world-wide competition last year ending in victory for Finland, contest modelers with a yen for a free trip over the sea are working out dream ships. Some of these new designs have already come to our attention. It's only a few months again until some kind of an Eliminations will have to be run off. Let's hope everybody will get a shot at the Eliminations this year. A good Wakefield remains one of the most challenging types in existence. It must be strong, simple, efficient, and light. Very, very rarely does any builder manage an acceptable Wakefield that weighs in at the minimum weight permitted by rules.

It is too bad that what tends to be the most popular event in the world, the one with the greatest potential appeal to youngsters, is also one of the toughest you can enter. The Wakefield model is high powered, relatively fragile, a fiend to adjust right without breaking things up, and beset by mechanical contraptions like tensioners, springs, dethermalizers, folders, retractable gears and all the rest of the super-expert stuff. Is it any wonder that the average age of the Wakefield team members is high for any sport? This is truly the "old men's event."

What we would like to see would be some important outfit, like Plymouth, kick over the traces and put all this on the level of the real American boy. Don't throw that tomato, you with the smoke coming out of your nostrils. Just a handful of events for the simplest kind of models, with simple rules. Maybe even a choice of full size printed plans available via the sponsors distribution system. Sure we have ideas on the types of models or sizes, but we've said enough for this round. Lord Wakefield would cease revolving in his grave if he knew that 100,000 boys had competed from all lands, in the spirit he envisioned, and not a few hundred old men, some of whom can't even chase their own models. (That's us!)

Right in this family, why should this ancient character have his eye on a try at

(*Turn to page 55*)

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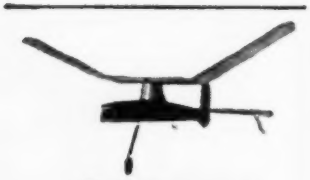

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Flash

PRESIDENT TRUMAN'S decision to withhold $615 million from the 1950 fiscal year appropriation, in order to force the Air Force to his desired 48-Group level instead of the 58-Group level voted by Congress, means a stiff slash in aircraft procurement. Air Force has repeatedly revised its procurement schedule in order to get the most fighting power for its money but the last-minute slash by Truman eliminated nearly all experimental aircraft development awards from the new program. As a result, the Air Force will buy only regular production airplanes in the coming year. Among the bombers are the Convair B-36 and the swept-wing, super-fast Boeing B-47 jet bomber. In the all-weather category, the Air Force will buy additional Northrop F-89 twin-jet fighters and the new Lockheed F-94 version of the familiar single-jet design. In the standard fighter category, Air Force will get additional North American F-86 swept-wing craft and more Republic F-84E ground-cooperation types. In other categories are the Douglas C-124 strategic cargo plane, the Grumman SA-16 air-sea rescue plane and a variety of helicopters and trainers. Navy will concentrate on its Grumman F9F and McDonnel F2H high-flying twins, the Douglas AD *Skyraider* and the Lockheed P2V *Neptune*, although its sharply-curtailed procurement plans are not yet clear.

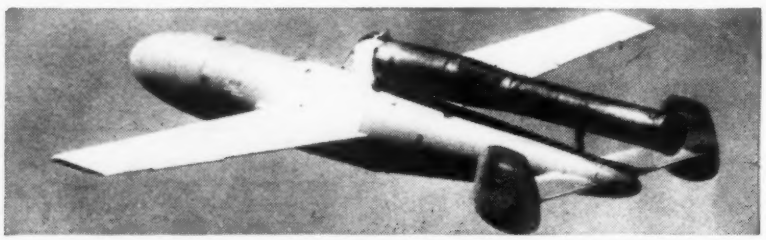
USAF HAS set up a special test program to determine the operational procedures and performance of the North American B-45 Tornado bomber as a simulated jet transport. The nearest approach to a multi-engine commercial jet transport now in operation in this country, the B-45, will be used over a simulated cargo run to compare its operating costs and problems with more conventional aircraft. The B-45 is roughly comparable to the famed DeHavilland *Comet* jet liner and all U.S. aircraft manufacturers will receive the test data determined by the program.

NOT ONLY will Capital Airlines become the first U.S. air line to operate the new Douglas *Super DC-3*, but it has ordered them equipped with the CAA-developed "cross-wind" landing gear. Capital plans eventually to purchase a total of 20 *Super DC-3's* with the new gear, but the "pay-as-you-go" financing plan of the air line for the new equipment permits it to buy only three at the outset. The landing gear is manufactured by Goodyear Aircraft Corporation and will permit the Capital *Super DC-3's* to get into fields with ample margin that now are considered risky.

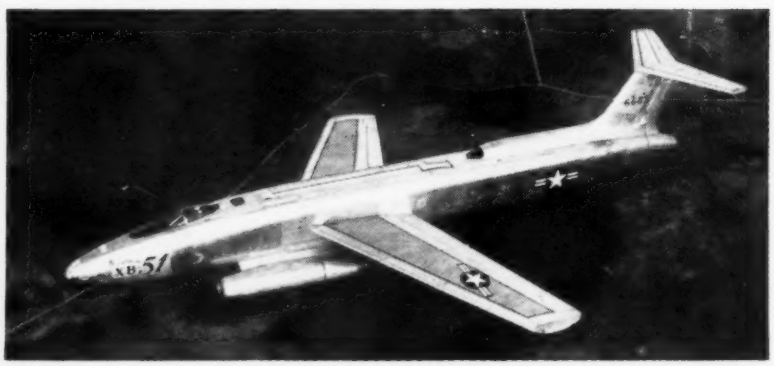
BEECH AIRCRAFT's new *Twin Bonanza* recently made its first test flight successfully with veteran Beech test pilot Vern Carstens at the controls. The new Model 50 resembles the familiar *Bonanza* in many respects but is powered by two Lycoming 260 hp engines. It is designed to cruise at 180 mph over a 1,000-mile range. The new model is six-place and is expected to sell for about $30,000.

THE LONG-KEPT secret has finally been let out and the Air Force has announced that its new Air Engineering Development Center will be located on a 33,000-acre site about 75 miles southeast of Nashville, Tenn. The site was formerly Camp Forrest and William Northern Air Field and was one of 25 surveyed for the installation. Initial construction at the site will include an 8' x 8' supersonic propulsion wind tunnel, a high altitude jet engine test chamber, and a supersonic wind tunnel capable of reaching Mach No. 5. Although the Air Force has set aside an initial outlay of

(*Turn to page* 54)



Above The KD2G-2, a pulse-jet powered target drone is radio-controlled; sizable quantities are on order. Below Martin XB-51 Ground Support plane gets a total of more than 16,000 lbs. thrust from its three J-47 jet engines



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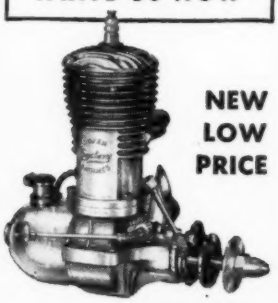

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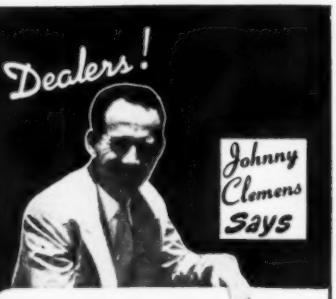

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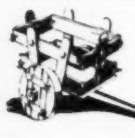

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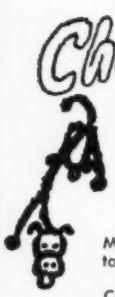

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REPORT FROM THE WEST

by Lew Mahieu

THIS month we have some contest results and also news from Southern California modelers who are now situated in other states.

It's about time for the contest season to slow up in California; the temperature has averaged almost 90° during November and with no wind the boys just couldn't resist flying those free flights.

On November 13, Fontana was to hold a free flight gas contest with two events, AA Gas and ABCD Gas. Strange as it seems, the day was very warm and there was no wind except in Fontana itself. It can hardly be explained, but five miles from the spot where the contest was to be held, there was not a breath of air stirring. The contest was postponed until the following Sunday.

From Fontana a large group of free flighters came over to the *Los Angeles Aero Modelers'* field and started flying while the *Aero Modelers* held their Annual U-control Meet. The *Northrop Model Mechaneers* headed by Mr. Holt, an AMA Contest Director, handled the meet very nicely for the *L.A.A.M.* Don Newberger was chief timer. In addition to the twelve beautiful trophies awarded by the *L.A.A.M.*, The Northrop Aeronautical Institute gave a big trophy with a Northrop Flying Wing on top, which was awarded to the club acquiring the most points during the meet. The winning club—The *Riverside-Winders*. Classes A and B Speed were combined and the B's

Don Newberger (left) and Mel Weaver Tuning up Mel's "D" Speedster, which later hit 153 mph

were handicapped by giving the A's their speed plus 10 mph. Classes C and D Speed were combined and the C's were given ten miles. Individual winners were: *Precision*—George McKay 354.5; H. Lorence 352; Bob Palmer 332. *Junior Precision*—Harold Selsen 336.6. *A & B Speed*— Lew Mahieu 134.27 mph; George McKay 123.88 (A plus 10); Jerry Strawn 114.6 mph. *Junior*—Steve Jentges 115.35 mph. *C & D Speed*—Lew Mahieu 154.52 mph (C plus 10); L. Christensen and George McKay tie for 2nd at 137.35 mph; Steve Jentges 126.84 mph. The only successful record run was made by Dick Rigney, of Long Beach, when he sent his *Circulator* circulating to the tune of 139.76 mph. This bettered his Class B Senior mark and AMA record by 6 mph. Nice going, Dick.

Well, all the time that the U-control meet was going on, we watched those free flight boys out on the field having a big time. Everything was going up, straight up. They were getting ten-minute flights on *Infant* jobs till almost 4 p.m. Carl Launderville of the *Flight Masters* sent his "D" job up for three ten-minute flights in a row, using engine runs from 9 to 11 secs. His last flight was 50 min. and landed only a short distance away at approximately 3:30 p.m.

The first place winners of the Fontana Free Flight Gas Contest held November 20, 1949, were; *AA Gas*—Chuck Diller. *ABCD Gas*—Carl Launderville.

Regarding the 1950 AMA Rules and changes, we don't know as we write this if a set of Team Racing Rules were O.K.'d or not, but everyone on the West Coast is anxious to see such an event run at the 1950 Nationals. The *F.A.S.T. Club*, for the past year has donated all its time and effort

1949 Western Open sweeps winning Don Donahue with his *Arden* .099 entry

to this new and thrilling type of contest. They have already planned their 1950 season and are pulling for this event in every way.

The *San Diego Aeroneers* held their End-O-The-Year Contest November 27. As usual, the *Aeroneers* had a good turn out and a swell meet with all classes of free flight gas including Class AA. The winners: *Class AA*—Dick Everett; Chuck Diller; L. Marerburg. *Class A*—Ray Acord; Dave Converse; J. Bicknell. *Class B*—Don Hoyle; F. Swaney; J. Bollinger. *Class C*—B. Ellwood; Wally Short; D. Page. *Class D*—Denny (Flash) Davis; A. Rominger; Carl Launderville. *Junior* winners—J. Bollinger and Bob Turner.

We are happy to say that we received a letter from Paul "*Civy Boy*" Gilliam. Paul got an offer for a job in Lubbock, Texas, that was too good to turn down. He is now in the advertising photography game. Paul states that he and his partner have the only color photography lab in West Texas. The *Texas Eagles*, of Lubbock, has been reorganized and now have a membership of fifty. They have a wide and varied model program under way. They are developing junior talent and getting the younger members of the club started on the right track. Paul says he regretfully left the *San Valeers Club* in August and since coming to Lubbock, is leading this new club as their president for 1950. The *Eagles* have a promising roster for the 1950 Nationals. We hope to see Brother Gilliam around Christmas when he plans to visit the West Coast. Good work, Paul, and we want to see you leading a team of *Eagles* and shooting for that team championship at the 1950 Nats.

Contest Director Francis Stewart sends us the results of the *Bakersfield Gas Model Airplane Ass'n* Semi Annual Free Flight Contest of November 6. The meet drew almost 100 entries and ships were hand-launched because of wind. The boys from Bakersfield, Fresno, and that area are used to the wind and showed the rest of the entrants how to fly in such conditions, by

(*Turn to page* 46)

James Martin prepares his very successful *Flying Airfoil* for another flight

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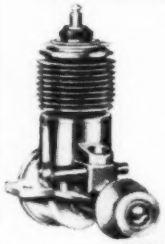

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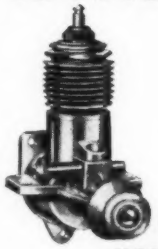

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An Engine for Every Class
A Model for Every Purse

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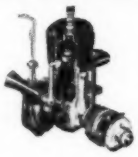
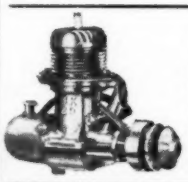


Class A "O.K." BANTAM

—an improved 1950 model of the record smashing engine, designed by Ben Shereshaw, noted model engine designer. Wt. 3¼ oz. RPM 2,500 to 11,600. Complete with spark plug and tank for only **$11.95**

Class A "O.K." BANTAM

—**GLOW PLUG MODEL.** Features all the championship performance and construction details that won world-wide fame for its brother spark plug model. Complete with plug, less tank..... **$9.95**



Class B "O.K." SUPER 29

—with high-compression head, rotary valve and ram induction. Complete with spark plug and tank, an outstanding bargain at only..... **$11.95**

Class B "O.K." HOT HEAD

—extra rugged for the extra stresses of pre-ignition firing. Will exceed spark ignition speed when "O.K." Hot Head Fuel is used. Wt. 7 oz. Complete with plug, less tank, only **$9.95**

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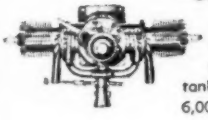
—aluminum crankcase for lightness. Large size ball-bearing and new domed cylinder head for smooth performance. With 3-position timer located at rear for easy access. Complete with spark plug and tank..... **$11.95**

Class D "O.K." SUPER 60—

—**GLOW PLUG MODEL.** With steel cylinder, hardened crankshaft and hardened and lapped piston for long wear. Complete with plug, less tank. You can't beat this value at only... **$9.95**



"O.K." TWIN

—an experimental engine for large models and radio-controlled ships. Wt. with tank 23 ozs. RPM 1,000-6,000. Complete, less coil..... **$49.00**

"OK" COILS

—fast spark, low battery drain. Models for A to D Class engines. Complete with lead **$1.50**

Famous Twin Coil with leads and matched condenser — for all makes of two cylinder engines—now at new, amazingly low price. Only.... **$3.50**

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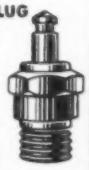
—the basic trainer in the compressed gas class. No gasoline, battery, timer, coil or spark needed. Wt. bare ¾ oz. RPM 3,000-7,000. Complete, ready to run..... **$4.95**

New "OK" GLOW PLUG



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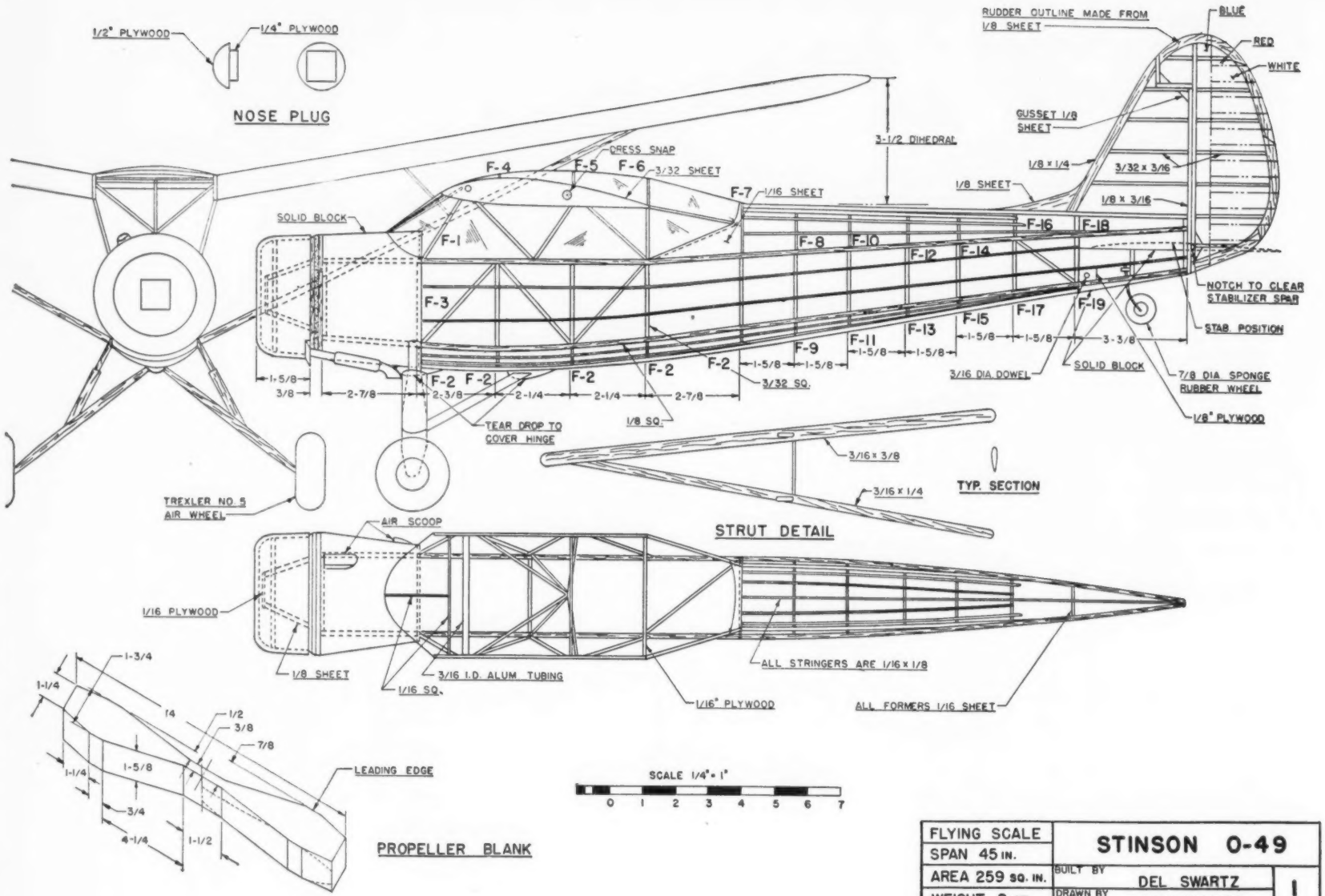


FLYING SCALE	STINSON 0-49
SPAN 45 IN.	
AREA 259 SQ. IN.	BUILT BY DEL SWARTZ
WEIGHT 8 OZ.	DRAWN BY JACK KELLER — 1

Championship O-49

Wt.—14 oz.

Free-Wheel Prop

'49 Nats Scale Winner

Averages over 2 min.

Multi-Spar Wing

20 Strands ¼ in. Flat T-56

An Ideal Competition Design

Scale Tail

by DEL SWARTZ

DESIGNING of the Stinson O-49, tagged model No. 74, began in 1939 and the plane was released in the latter part of 1940 to the U. S. Army. It is a two-place job having a span of 50′ 10-3/4″, a length of 33′ 6-1/2″, and a height of 9′ 10″. It is powered by a Lycoming R-680-E3A, 280 hp engine of 9 cylinders. The ship has a long tail moment arm, and a stabilizer approximately 25% of the wing area, which all adds up to a fine flying scale ship.

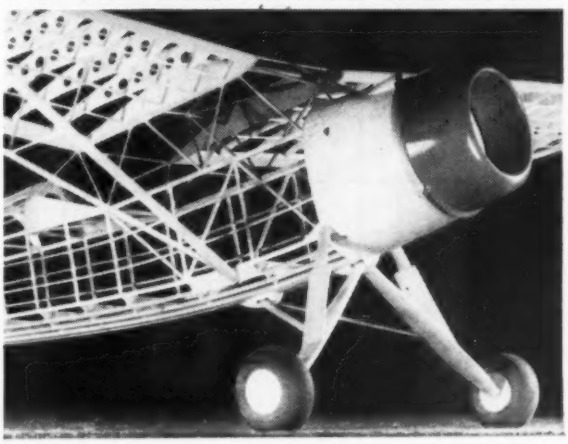
Flying scale times at the 1949 "Nats" were not too spectacular due to the terrific wind that seemed to be blowing straight down, just as it was in 1948. Many of the scale fliers walked home with an extra sanding job (from scraping the concrete!) that they didn't have before they flew. Were those runways rough! The best time on the O-49 was 50 secs., with four strands broken and the prop flopping around the gear. After getting back to sunny California and away from the field "just across the road from the wind belt," I wanted to see what the model would do in normal flying weather. It turned in flights averaging over two minutes. The model flew best with 1/4" wash-in in the left panel, 4° left rudder, 7° downthrust and 7° right-thrust.

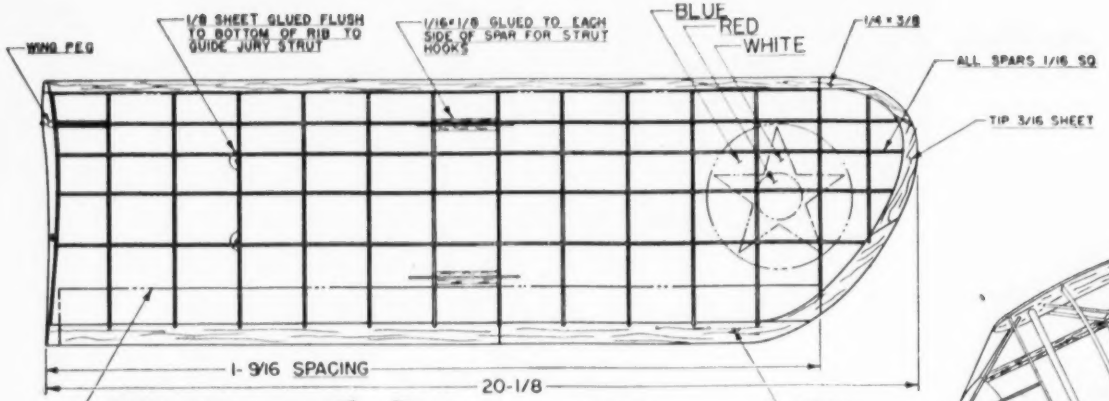
For a competition ship such as this, construction must be neat and clean, but the model is not too difficult if you follow the plans and instructions.

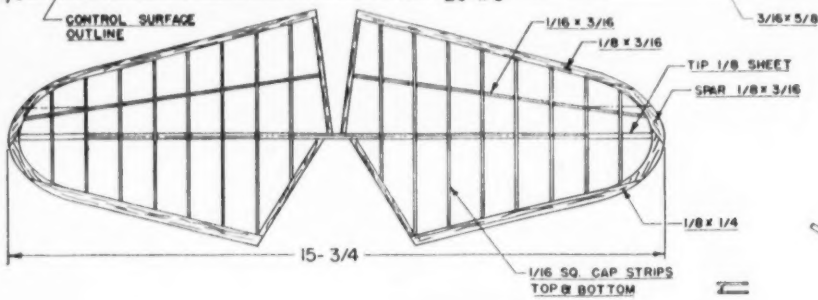
Start with the fuselage construction. The longerons are 1/8" square with 3/32" square cross braces set flush with inside of longerons to keep covering from sticking to the cross bracing. After main structure is completed, next comes the greenhouse construction. Make two base ribs from 3/32" sheet and two jigs—dimensions taken from front view—from 1/16" sheet. Tack lightly with cement at the point where the main spar runs through, and also between the points where the diagonal window bracing joins. Sand about three 3/32" square lengths of balsa to a round shape to represent tubing. Use a talcum powder and dope mixture for a filler, applying a couple of coats of clear first to give a base for the filler. Cut the lengths to size by trial and error, and cement in place. When dry remove jigs and cement remaining tubing structure and 3/16" aluminum tubing for wing connections. This type of rigging was used for easy handling and to take up the shock of nasty landings, and it has proved out very well. For the main spar, the ship has extra large tubing running through the greenhouse, which affords a clean housing for the bands that hold the wings together.

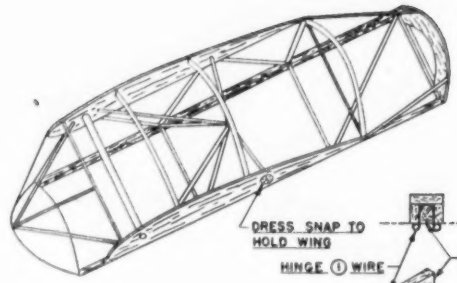
The nose is formed from medium blocks and these are left solid to help balance the model. Finish the fuselage with bulkheads and stringers, sanding bulkheads between stringers after drying, as shown on the plan, to assure neat covering.

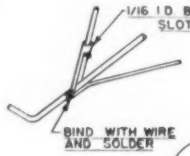
(*Turn to page* 41)

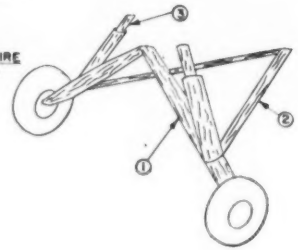






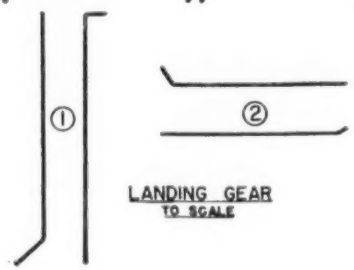






TYPICAL STAB. CONSTRUCTION

TAIL WHEEL
TO SCALE
1/2" = 1"



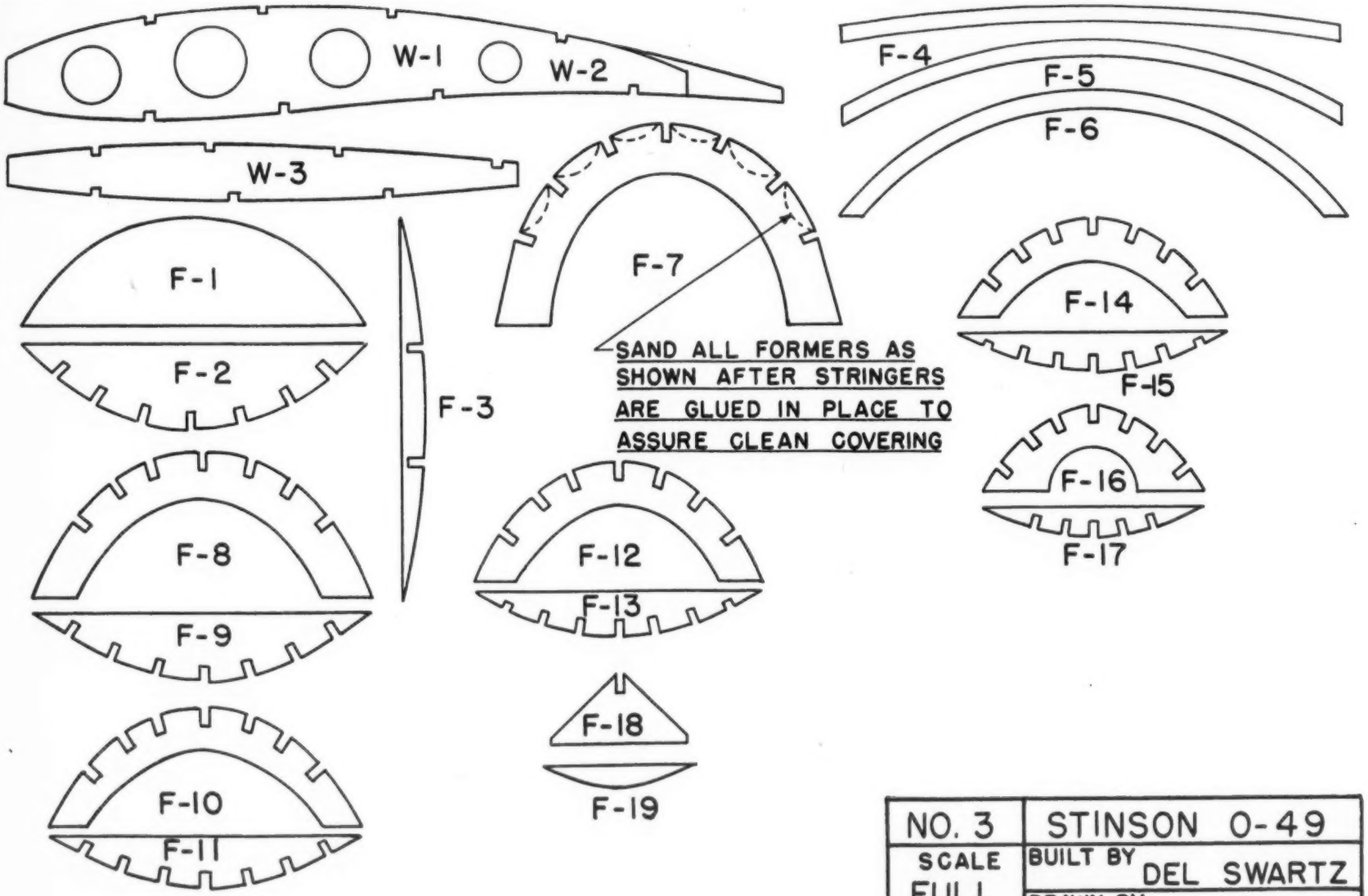
LANDING GEAR
TO SCALE

CONSTRUCTION HINTS
NOT TO SCALE

FLYING SCALE	STINSON O-49
SPAN 45 IN.	
AREA 259 SQ. IN.	BUILT BY DEL SWARTZ
WEIGHT 8 oz.	DRAWN BY JACK KELLER

2

WEIGHT 8 oz.	DRAWN BY JACK KELLER



NO. 3	STINSON O-49
SCALE FULL SIZE	BUILT BY DEL SWARTZ
	DRAWN BY JACK KELLER

Lawrence Special was project of Lawrence Tech (Detroit) students

Kistler Special *Wingwax* took 9th place (153.4 mph) in Goodyear Final

Anderson Special has diamond-shaped fuselage

Leighnor Special *Mirage* was 3rd in Consolation with 145.8 mph

pee-wee pylon polishers

by JOHN L. MACKENZIE

FOR six long years those of us who go in for scale models have had a steady diet of military airplanes. Fighters, bombers, attack, and all the rest offered a heyday for this type of model building, but even modelers can become war-weary. So, it was with cheerful expectancy that we entered the post war period looking for something new. Especially we looked forward to the resumption of the National Air Races as an inexhaustible source of original modeling subjects. But lo-and-behold, came the 1946 races and what happened? The old war horses appeared in new dress and completely dominated the high-speed game.

Now that situation might have been a sorry blow to poor old Joe Modeler had it not been for the fact that at those same races was planted the germ of a new day in air racing, which has blossomed into the answer to the most ardent addict's prayers. For there at Cleveland were born the ideas which have culminated in the Goodyear Trophy Race.

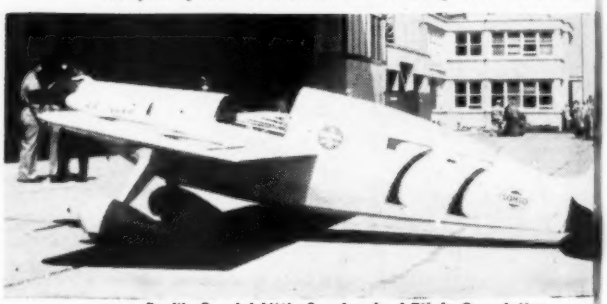
For three successive years now the Goodyear has been held and each race has produced a greater number of new planes than any previous racing competition, for one of the underlying purposes of this event is the development of new and better ideas in light aircraft. It is aimed particularly to bring out those techniques and devices which are born in the back yard workshops of our nation, gimmicks which our great engineering laboratories might never uncover. Needless to say then, the Goodyear Race has been the greatest gold mine of designs adaptable to flying as well as nonflying scale models that has ever come our way.

In our report of the Air Races (see M.A.N., December, 1949,) we mentioned briefly the planes and pilots which flew to victory in the latest running of the Goodyear. Since there were twenty-five entries in all, it would hardly be fair to the modeling public to stop with the top few. Many of the craft which did not hit the winners' circle are worthy of attention. So, this month we present a collection of photographs and data which includes many of the also-rans.

For the benefit of those who are not familiar with this small racing class, let us briefly summarize its limitations of

(*Turn to page* 52)

Thompson Special had doubtful honor of last place in Consolation



Beville Special *Little Spook* gained 7th in Consolation

Famous *Long Midget* made 167.3 mph for 8th in Final
Downey's Mercury Air *Shoestring* was 7th in Final with 171.4 mph

DESIGN FORUM

by CHARLES H. GRANT

"DIFFERENCE in opinion makes the world go around." This is an old saying that is especially true of the model aviation world because this science is still in the experimental stage with so many new facts and angles to discover and ample room for many different view points. This in fact is what makes our scientific hobby so interesting. When everything is known and there is nothing new to discover, most of its attraction to scientific model fans will be gone, and this type of aviation fan is the backbone of the whole game.

Lately considerable differences in opinion have arisen in respect to the relative value of folding propellers, free-wheeling propellers and normal fixed propellers for contest models. One group of model builders advocate folding propellers as the best way to eliminate drag and thereby gain greater duration for rubber driven aircraft. Folding propellers in fact have been more or less universally adopted by American contest fliers, and have almost entirely replaced free-wheeling propellers in this country.

However in the last two Wakefield competitions, American model fliers received quite a shock. The overseas winners, with free-wheeling propellers driving their contest models, walked away with the first place trophies. These two forceful arguments for free-wheeling propellers have induced model builders to review their possible advantages. Abroad practically no one uses anything but free-wheelers. They say they have tried folders (shown in Fig. 1) but find that free-wheelers (Fig. 2) give equally successful, if not better, results.

The theory of the folding propeller is based on increasing the length of the glide by *reducing* the propeller *drag*. In other words, the whole airplane has a higher lift drag ratio. This provides a flatter gliding angle and lower sinking velocity. It is the sinking velocity in which we are chiefly interested because this is the actual measure of how long the airplane will remain in the air without power. However it is possible to decrease the sinking velocity by *increasing* the *lift* without changing the drag. This is the other side of the equation so to speak. Instead of reducing the sinking velocity by decreasing the drag and flattening the glide, it may be reduced by increasing the lift and thereby decreasing the *speed* of the glide even though the angle of glide may be greater. It is this method which forms the basis for using the free-wheeling propeller. The free wheeling propeller increases the drag of the airplane but when the airplane is *nosed downward* into a gliding position, the drag has a vertical lifting component (Fig. 3). This upward force at the propeller hub actually tends to support the airplane and decrease the sinking velocity by increasing the lift. This is logical because the sinking velocity is inversely proportional to the square root of the lift coefficient.

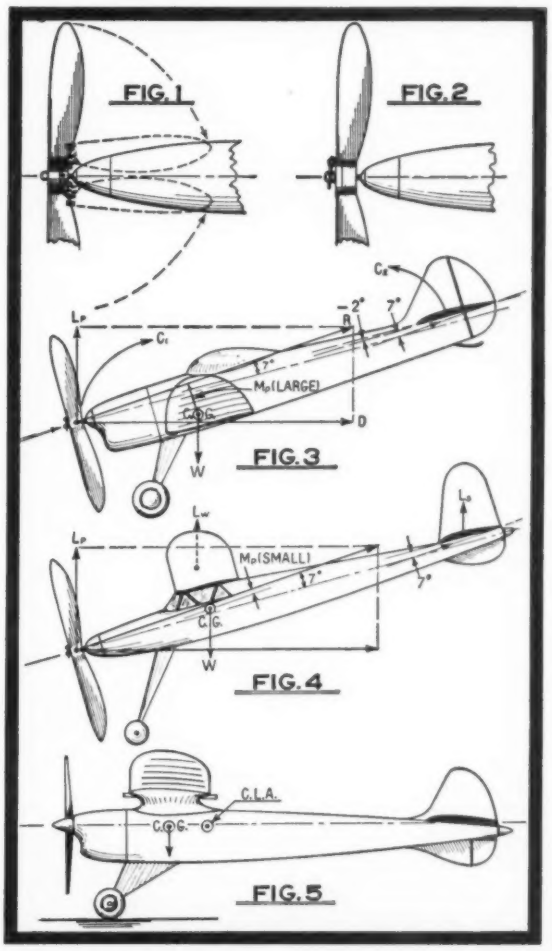
Differences in opinion and actual comparative results rest not in the qualitative but in the quantitative relationships of this problem. Whether or not the free-wheeling propeller is superior to the folding propeller depends upon *how much* lift results from the free-wheeling propeller compared to how much the folding propeller flattens the glide. When the glide is flattened to the extent that the sinking velocity of the folding propeller plane becomes less than the sinking velocity of the free-wheel plane, then obviously the folding propeller is better. These quantitative results are very hard to prove through theory because usually they involve complicated mathematics and even these often do not take into account many factors which may be overlooked or entirely unknown. The only certain test is actual practice.

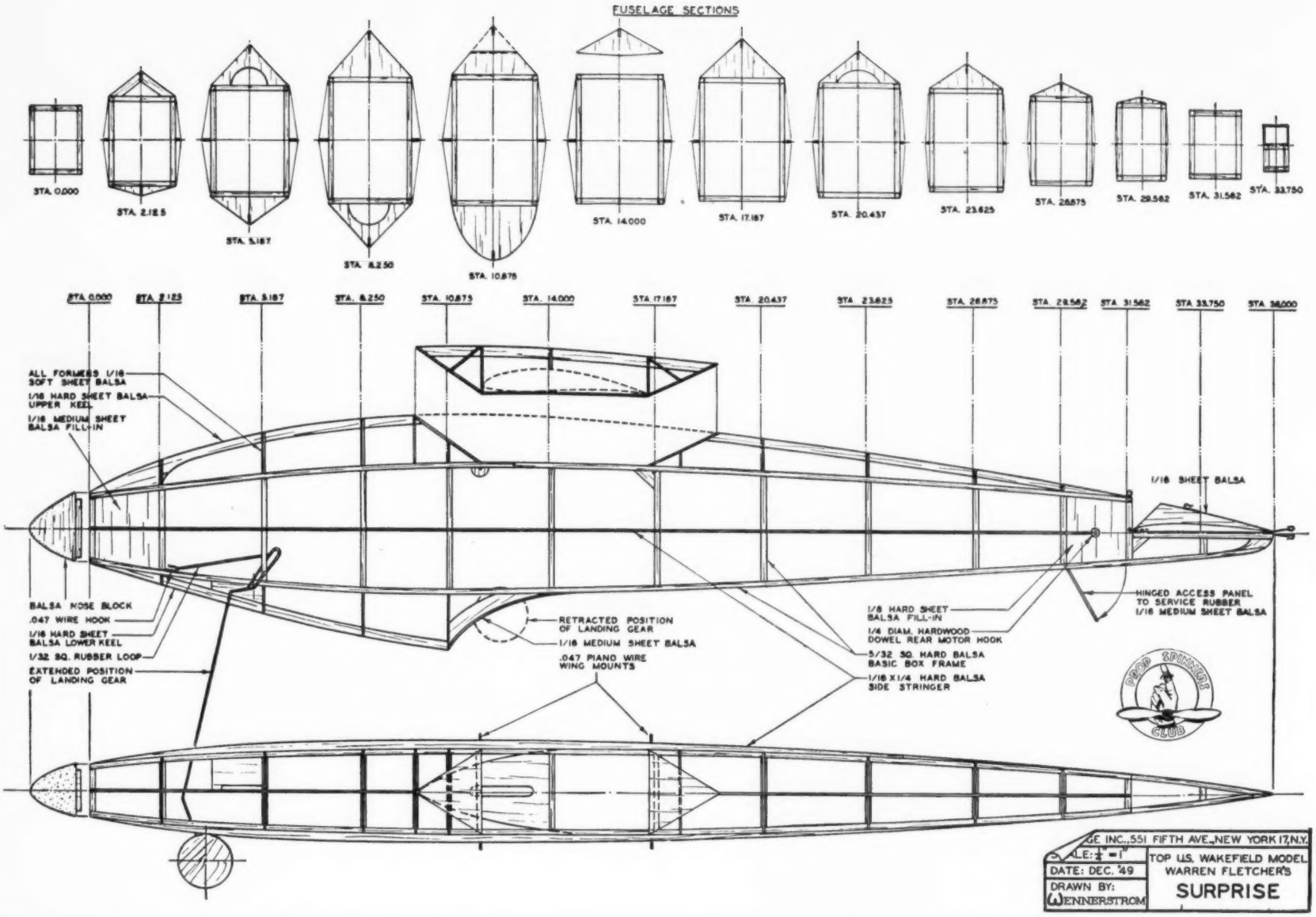
Our readers may lean to one side or the other of this argument. In fact the more difference of opinion that arises concerning the problem, the greater will be the interest in solving it. So here we present an interesting experimental project. This experiment might proceed as follows:—Select or build a typical rubber-driven contest model; even a good experimental rubber driven model will suffice, Fig. 4. Equip this model with a folding propeller and fly it over a period of time under various conditions, taking the average flight time under given conditions of winding, weight, amount of rubber used, etc. Then if your airplane is all in one piece and still in proper alignment, equip it with a free-wheeling propeller of exactly the same aerodynamic design as the folding propeller. You will note that in this latter type the propeller spins free on the shaft under gliding action when the rubber motor ceases to exert torque. A simple free-wheeling arrangement is shown in Fig. 2 in which a pin is looped or hooked through an eyelet in one of the blades. When the motor is to be wound this pin is inserted through the loop in the end of the propeller shaft so that when the motor exerts torque the loop presses against the pin, wedging it tight. The propeller then turns with the shaft. When the shaft ceases to drive the propeller, the propeller tends to spin freely, driven by the air passing through its arc during flight. This spinning pulls the pin from the loop completely disengaging it.

The idea which induced the use of the free-wheeling propeller was the belief that it would create no drag when spinning free. However, actually it creates a decided thrust backward approximately parallel to its shaft because of the *autogyro effect*. This lifting effect is clearly demonstrated in the action of a maple seed which, as it spins while falling, generates sufficient lift to allow a gentle and slow descent. If this seed falls without spinning, it drops quickly. A modern example is the helicopter. When the rotor is driven by the engine with blades at a positive angle of incidence the blades generate lift and the helicopter rises. On the other hand, when the blades are not driven by the engine but the rotor spins free, the blades pass through the air as a positive angle of attack but at a negative angle of incidence. In this way each blade actually glides down hill in a spiral path generating lift as the helicopter descends in the same manner that lift is generated by a gliding airplane.

A free-wheeling propeller generates lift approximately parallel to its axis on this autogyro principle, even though the

(*Turn to page* 42)




FUSELAGE SECTIONS
STA. 0.000
STA. 2.125
STA. 5.187
STA. 8.250
STA. 10.875
STA. 14.000
STA. 17.187
STA. 20.437
STA. 23.625
STA. 26.875
STA. 29.562
STA. 31.562
STA. 33.750
STA. 36.000
ALL FORMERS 1/16 SOFT SHEET BALSA
1/16 HARD SHEET BALSA UPPER KEEL
1/16 MEDIUM SHEET BALSA FILL-IN
BALSA NOSE BLOCK
.047 WIRE HOOK
1/16 HARD SHEET BALSA LOWER KEEL
1/32 SQ. RUBBER LOOP
EXTENDED POSITION OF LANDING GEAR
RETRACTED POSITION OF LANDING GEAR
1/16 MEDIUM SHEET BALSA
.047 PIANO WIRE WING MOUNTS
1/16 SHEET BALSA
1/8 HARD SHEET BALSA FILL-IN
1/16 DIAM. HARDWOOD DOWEL REAR MOTOR HOOK
5/32 SQ. HARD BALSA BASIC BOX FRAME
1/16 X1/4 HARD BALSA SIDE STRINGER
HINGED ACCESS PANEL TO SERVICE RUBBER 1/16 MEDIUM SHEET BALSA
PROP SPINNERS CLUB
GE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.
LE: 1/2" = 1"
DATE: DEC. '49
DRAWN BY: WENNERSTROM
TOP U.S. WAKEFIELD MODEL
WARREN FLETCHER'S
SURPRISE

the wakefield "surprise"

by WARREN FLETCHER

EARLY in June of 1949, I suddenly realized that there should be a Wakefield Elimination Meet coming up somewhere in the New York area. I finally called Frank Zaic and found I had only two weeks in which to build and test a model. A week later I was out test flying my first attempt at a Wakefield.

What a struggle it turned out to be! The night before the Eliminations, while discussing the coming Meet with a friend, it "happened"! The *Surprise* was born on a scrap of paper, while we were gulping our dinner down. (Why is it a contest flier always waits until the last minute and then burns the "midnight oil" in order to have a ship for the contest the next day?) A few hours later, we were test flying what turned out to be a very worth-while night's work.

At the Eliminations the model made two over-the-limit flights, dethermalizing nicely each time. Needless to say, *we* were surprised!

The story and results of the Wakefield Finals were covered very thoroughly by team-mate Bob Hanford's article in the November, 1949, issue of MODEL AIRPLANE NEWS. Anything I might add here would only be repetition.

Now let's consider the construction. To get started, after the plans have been scaled up, lay out the sides of the fuselage. Build one over the other, using a piece of wax paper in between. In this way, they will be identical. It is just a simple matter to add the crosspieces, beginning at one end and working to the other. Then add the sheet fill-in where shown. While the fuselage is drying, cut out the formers, and the upper and lower outlines. The top outline is cut in one piece, from a sheet of 1/16" by 2" balsa. Cement the formers in place and then follow with the outlines. Next, drill a 1/4" hole in the sheet fill-in by the rear of the fuselage.

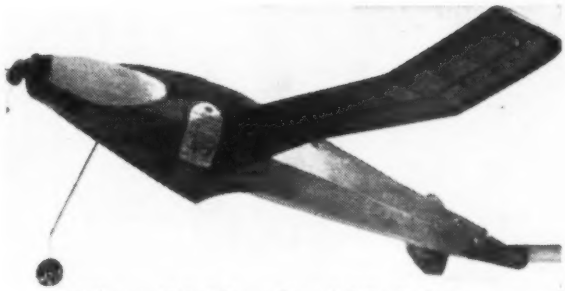
Before cementing the bottom formers and outline in place, bend the retractable landing gear from 1/16" wire. Bind it in place with thread, as shown; the gear is designed to retract slowly, utilizing the forward motion of the ship to bring it up in the well. The rubber band used should be about 1/16" square for best results.

Add the side stringers and wing hooks and then sand the completed framework smooth. The wheel is made by cementing two pieces of 1/16" sheet cross-grained, with a small-faced bushing in the center. Fasten the wheel on and the fuselage is ready for covering.

The stabilizer comes next. This part is very simple, as one look at the plan will reveal. Cut the rudders from 1/16" sheet and cover with tissue. Cover the stabilizer; then cement the two rudders in place.

The wing is the next item we have to consider. The only thing that may cause difficulty is the sheeting along the leading edge, so take your time on this part of the construction.

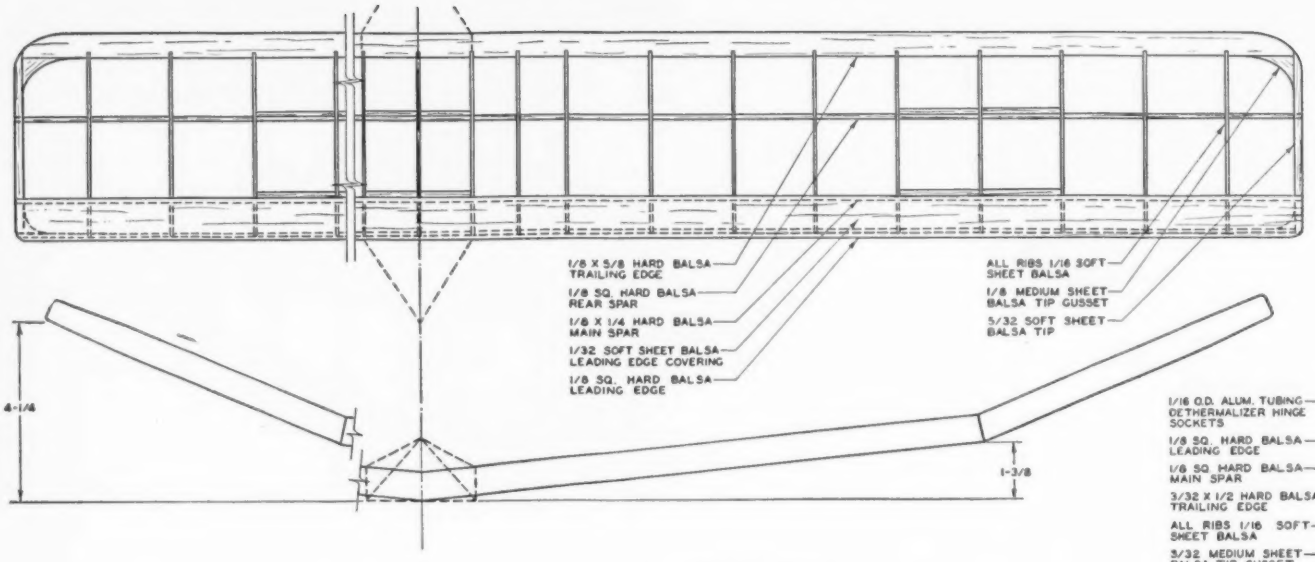
(*Turn to page* 55)

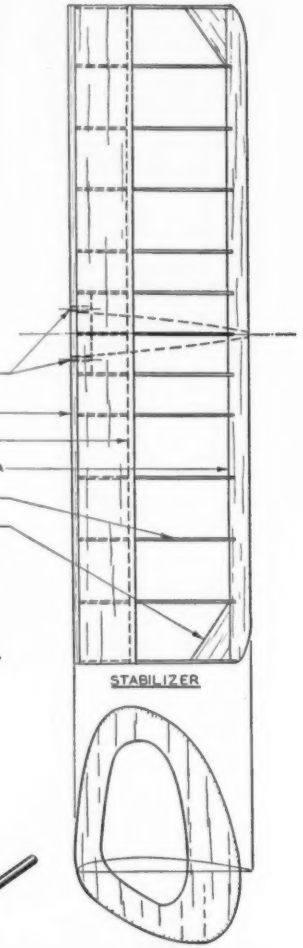


Single prop blade folds neatly against the fuselage nose

The *Surprise* topped all American entries and placed 3rd in '49 Wakefield

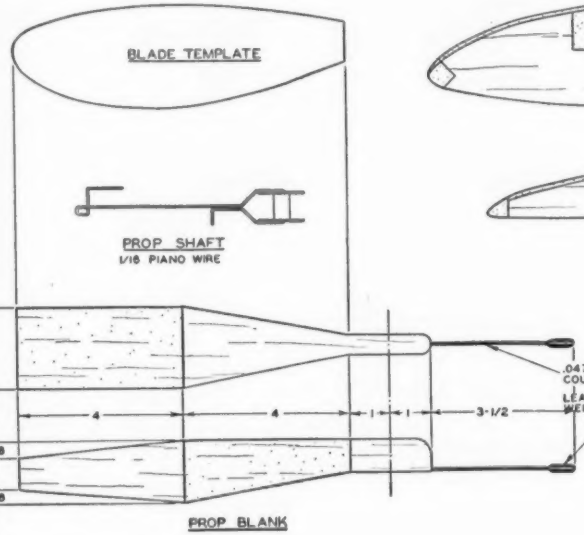
This is the accepted style for launching a Wakefield model


1/8 X 5/8 HARD BALSA TRAILING EDGE
1/8 SQ. HARD BALSA REAR SPAR
1/8 X 1/4 HARD BALSA MAIN SPAR
1/32 SOFT SHEET BALSA LEADING EDGE COVERING
1/8 SQ. HARD BALSA LEADING EDGE
ALL RIBS 1/16 SOFT SHEET BALSA
1/8 MEDIUM SHEET BALSA TIP GUSSET
5/32 SOFT SHEET BALSA TIP
4-1/4
1-3/8

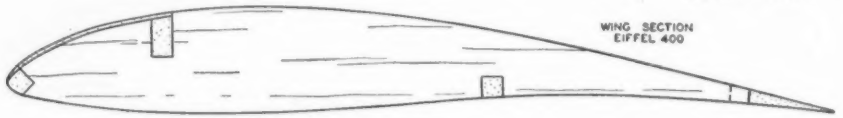

1/16 O.D. ALUM. TUBING DETHERMALIZER HINGE SOCKETS
1/8 SQ. HARD BALSA LEADING EDGE
1/8 SQ. HARD BALSA MAIN SPAR
3/32 X 1/2 HARD BALSA TRAILING EDGE
ALL RIBS 1/16 SOFT SHEET BALSA
3/32 MEDIUM SHEET BALSA TIP GUSSET

STABILIZER

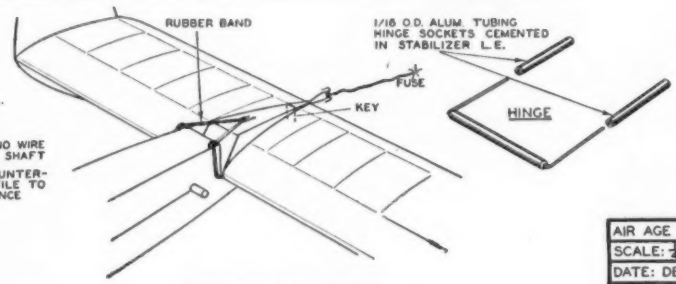
RUDDERS
3/32 MEDIUM SHEET BALSA



PROP BLANK

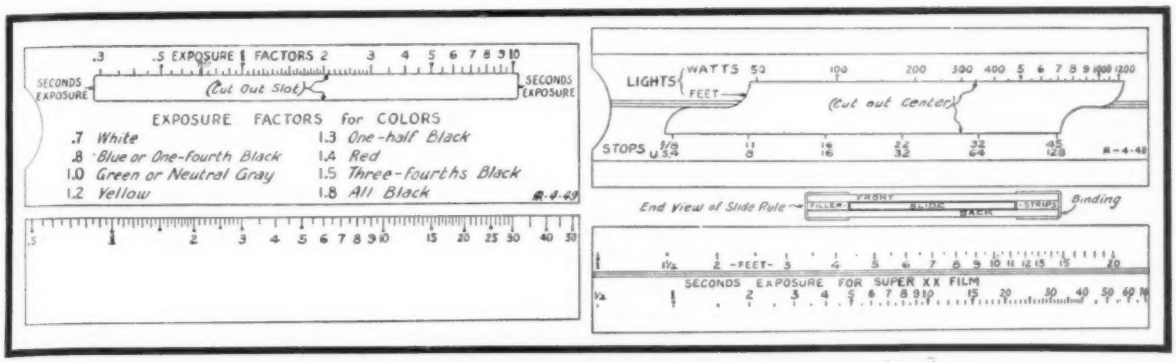


RIB SECTIONS ONLY-FULL SIZE



DETHERMALIZER DETAILS

AIR AGE INC., 551 FIFTH AVE., NEW YORK 17, N.Y.	
SCALE: 1/4 & 1"=1"	TOP U.S. WAKEFIELD MODEL
DATE: DEC. '49	WARREN FLETCHER'S
DRAWN BY: WENNERSTROM	SURPRISE



These scales may be enlarged by photostat so that you can make your own exposure slide rule

Model Portraiture

by RAY RUSHER

SUPPORTS and BACKGROUNDS—In general, white or light-colored supports and backgrounds are best, unless of course you want to take a picture of a white or light-colored model. In that case use gray if it gives sufficient contrast, black if you require maximum contrast. Black should also be used if you take a double exposure of a subject with some part of it in different positions to illustrate possible adjustments. An example is the picture showing correction for parallax in part 1 of this series.

The floor, a box on the floor, or a board blocked up against the wall may serve as a support for the model. A large drawing board on *three* fruit jars or filled vegetable cans works out very nicely without any danger of rocking movement during the taking of a picture. A window shade with its roller mounted on the wall provides an excellent background that can be rolled up out of the way when not needed. Pull the shade out sufficiently far to cover both the wall above the support and extend forwardly to cover the support itself. This hides the details of the support and eliminates a break line appearing between the support and the background.

The shade, photographing white, provides a background under and behind the model that shows no details to divert attention from the subject. There should be no wrinkles or dirty smudges as they will show up in the picture. By having the background shade two or three feet behind the model, its surface details will be more or less out of sharp focus and this helps the quality of the finished picture. A piece of gray or black cloth when needed can be laid against the shade and pinned along its upper edge to the shade.

PART FOUR

LIGHTING EQUIPMENT—Six 100-watt bulbs, porcelain or bakelite sockets, cardboard reflectors, and the necessary wire and plugs constitute the lighting equipment. Serviceable stands for the lights can be made as detailed in the drawings and illustrated in the photographs. The bases of the stands are orange crate ends cut down to 8" square with 4" squares on top to give about a 1-1/2" length for the holes that receive the uprights formed of 3/8" dowels. Wooden mounting blocks for the sockets are pivoted on wooden clamp blocks to swing up or down and, of course, can be rotated sidewise on the dowels or slid up or down as required to get all the adjustment you will need. After adjusting, a single clamp screw retains all three adjustments. By flame soldering (see May, 1949, MODEL AIRPLANE NEWS, page 43) short pieces of strip brass in the slots of the clamp screws, very serviceable wing screws are had; they can be easily tightened without the aid of a screw driver.

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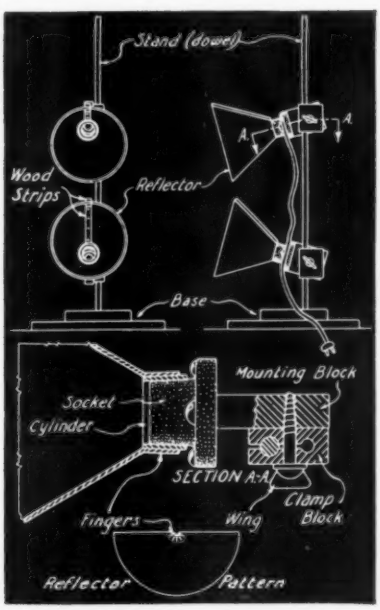
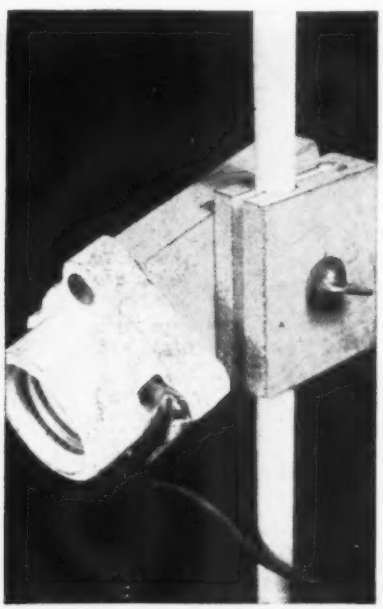
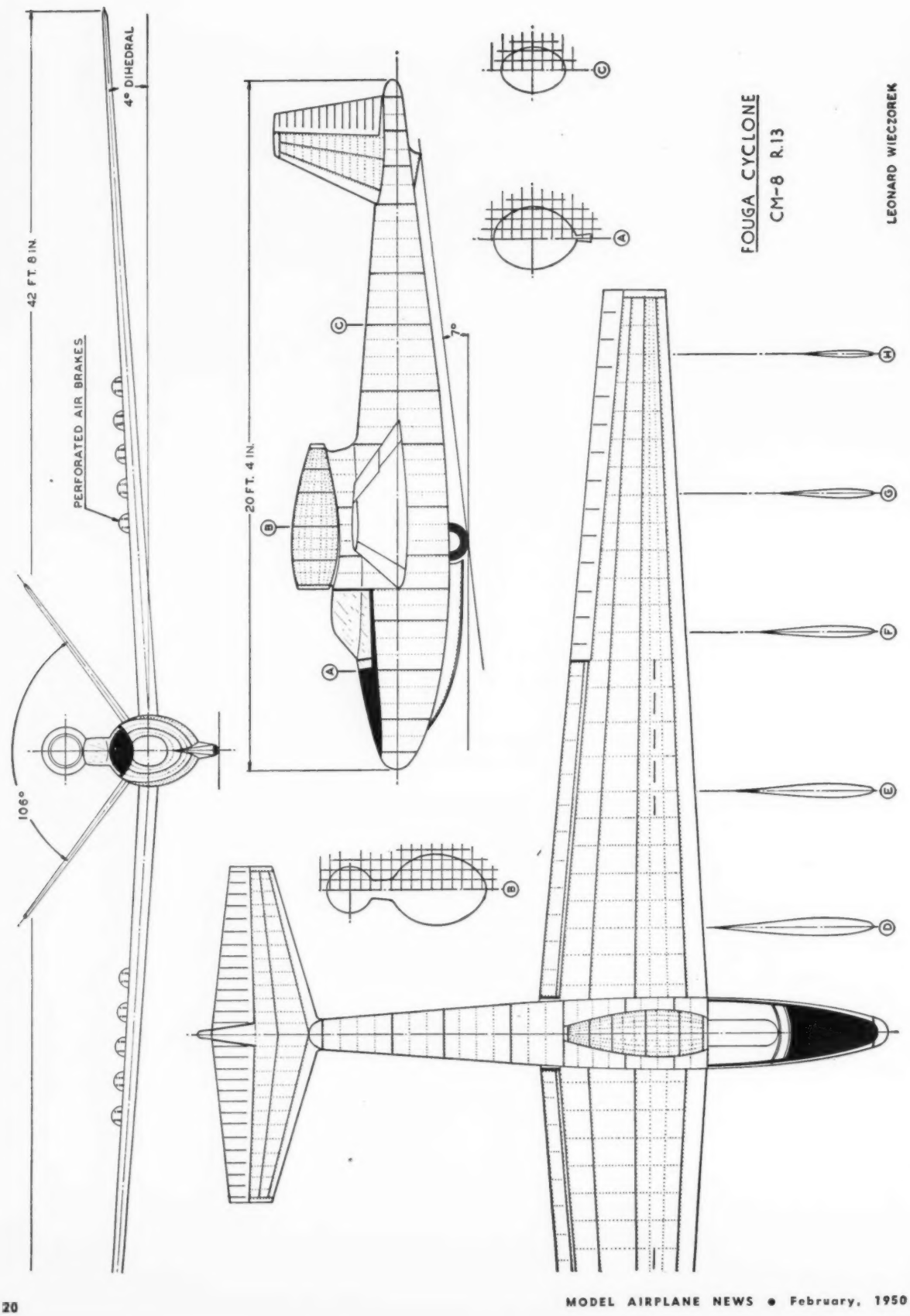
Lighting control panel allows selection of lights in any desired combination



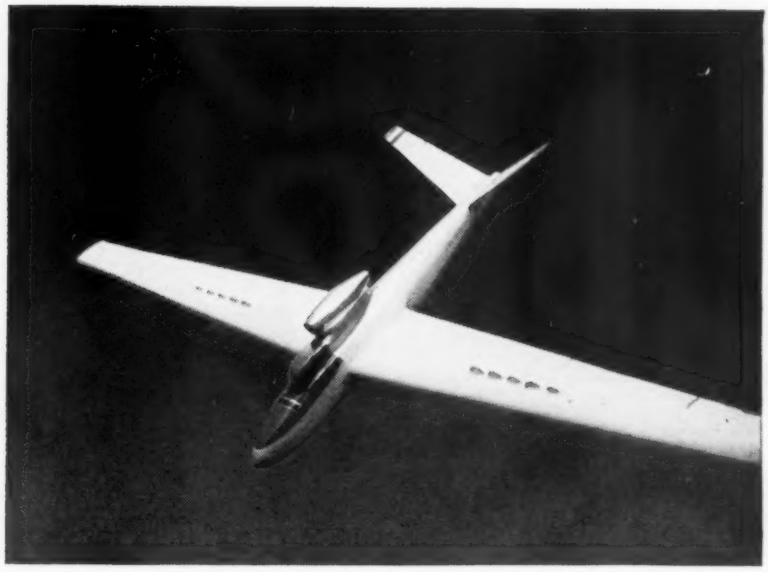
The lighting equipment is easy to make. Most of the parts are of wood



Close-up of mounting block, clamp block and bulb socket for lighting equipment


FOUGA CYCLONE
CM-8 R.13
LEONARD WIECZOREK
42 FT. 8 IN.
4° DIHEDRAL
PERFORATED AIR BRAKES
20 FT. 4 IN.
7°
106°
A
B
C
D
E
F
G
H

The combination of a high-performance sailplane and a light and efficient turbo-jet has produced something new and different in the aeronautical world



French Fouga Cyclone

by ROBERT McLARREN

WHO hasn't envied the jet fighter pilot with his huge crash helmet, skin-tight anti-g suit and thundering power dives and vertical rolls? To real flying enthusiasts, these are the luckiest guys in the world. But they belong to one of the most exclusive clubs in the world: the armed forces. Certainly no man enjoys this tremendous privilege that hasn't been subjected to the full flying school grind, the transition school and, in many cases, wartime combat experience. The airplane he flies is a $3,500,000 piece of machinery provided by the taxpayers and he has its responsibilities without ownership privileges.

Against this background it is obvious that the enthusiastic private pilot is many long jumps away from the stick of that fighter and the throttle of that jet engine. But suppose a small, inexpensive jet aircraft were to be made available: one with all the characteristics of an F-80 or F-86 but all of them scaled-down to practical size? You guessed it: anybody who produced an airplane like that would find an eager market waiting for him—if the price was right! But the airplane would have to work with dependability, it would have to be at least reasonable to operate (no 167 gallons of fuel just to warm up and take off as in the McDonnell F2H *Banshee!*), it would have to be safe and—most of all—it would have to sell for a price equal to that of a medium-priced automobile.

Sounds like a tough specification but flamboyant genius Pierre Mauboussin has produced just such an airplane in the Fouga *Cyclone*, our Plane of the Month. Not all of the problems are solved yet but Mauboussin has at least gone so far as to produce a prototype and to announce plans for its quantity production. But as fantastic as his idea sounds, it took this "crazy Frenchman" to turn the trick for assuredly no cautious, debt-ridden U.S. lightplane manufacturer is going to venture such a risk, not now nor for many years to come.

Mauboussin is a legend in French aviation, a legend not only for his stubbornness and independence but for the soundness of his designs as well. The individualistic Frenchman has consistantly refused to become employed and prefers to work in his own office unimpaired by either direction or bookkeeping. He earns his living by selling the license rights of his designs to others, who must worry about profit-and-loss statements, production tooling, factory worker unions, etc. In 1936 Mauboussin acquired at least an air of respectability by signing an exclusive license for the manufacture of all his designs with the Societe des Etablissements Fouga in Paris. Since that time the arrangement has worked at least reasonably well, as well, that is, as could be expected of such a genius as Mauboussin.

The French designer's principal talent has been the design of aircraft having good performance on a bare minimum of power, i.e., the true "lightplane." His first popular design, the M.123, was a two-seat low-wing monoplane powered by a 60 hp Salmson engine. This training plane, of which 50 were built, served widely as a sports and training aircraft and attained good performance on this mere 60 hp engine. His later designs used a 65 hp Regnier and a 90 hp Regnier engine, so that Mauboussin became well-known as "king of the light airplane" before the war.

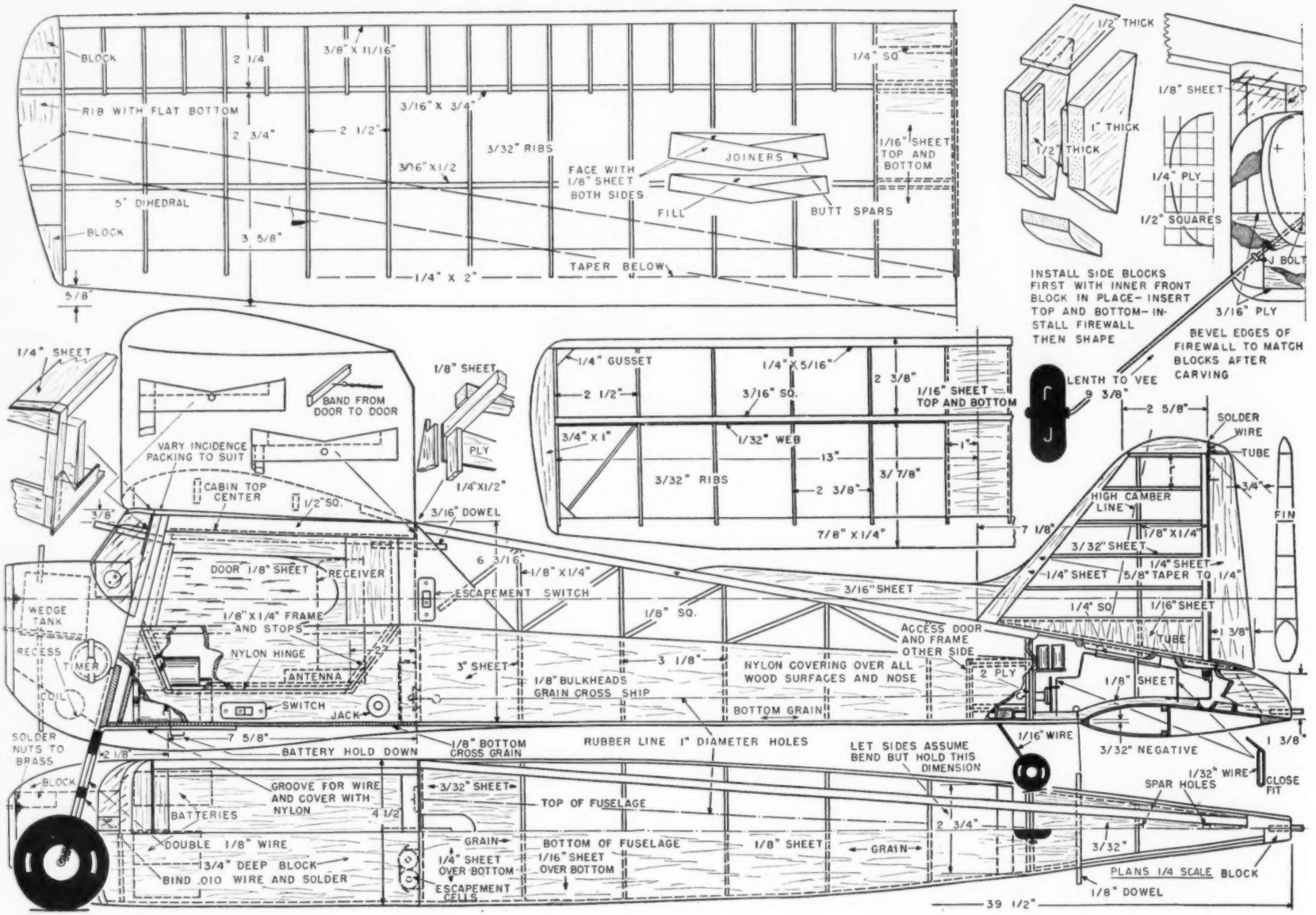
But Mauboussin's independence nearly cost him his success in 1938 when the French socialist government established the "Aviation Populaire" movement and set forth specifications for an official flying club airplane of which hundreds were to be purchased. Mauboussin had, at that time, a high-performance single-seat design in which the officials took considerable interest and promised him large orders if he would convert the design to a two-seater. This Mauboussin refused to do—and the award went to a rival!

But Maubussin continued to turn out designs with great rapidity. The M.300 was a 6-seat light transport powered by two Renault 6Q six-cylinder in-line engines of 220 hp. The M.400 was a twin-pusher cargo plane powered by two Bearn six-cylinder in-line inverted engines of 350 hp each. He also produced the M.129 and M.202, improved versions of his two-seat trainers.

But on June 17, 1940, France fell to the Germans and the French aircraft industry became disorganized and wholly disrupted. Mauboussin, refusing to collaborate in the production of German aircraft, turned his attention to gliders. He took into his office Robert Castello, a glider expert, and together they produced a series of glider designs that met complete success throughout France. Following the liberation of France, Mauboussin and Fouga resumed powered aircraft design and production. The team of Castello and Mauboussin had designed, during the war, a large transport glider, the C.M.10, capable of carriyng 35 fully-armed troops. After the liberation, Castello, Mauboussin, and Fouga made a joint arrangement by which Mauboussin was designated "Directors of Aircraft Department," Castello "Technical Director," and the Mauboussin design office was incorporated into the Fouga company.

By the simple expedient of installing two Renault 12S engines of 580 hp in this transport glider, the group produced the Fouga CM-100 (the "CM." of course, representing Castel-Mauboussin, Castello, for some unknown reason, dropping the last two letters of his name), which has a useful load of 12 passengers, a crew of 2 and 1022 lbs. of cargo over a 600-mile trip distance. The group has also produced the Castel-Mauboussin *Jalon* two-seat glider, which can carry a useful load

(*Turn to page* 51)


BLOCK
2 1/4
3/8" X 11/16"
1/4" SQ
RIB WITH FLAT BOTTOM
3/16" X 3/4"
2 3/4"
2 1/2"
3/32" RIBS
3/16" X 1/2
FACE WITH 1/8" SHEET BOTH SIDES
JOINERS
1/16" SHEET TOP AND BOTTOM
5" DIHEDRAL
FILL
BUTT SPARS
BLOCK
3 5/8"
1/4" X 2"
TAPER BELOW
5/8"
1/2" THICK
1" THICK
1/2" THICK
1/8" SHEET
1/4" PLY
1/2" SQUARES
J BOLT
3/16" PLY
INSTALL SIDE BLOCKS FIRST WITH INNER FRONT BLOCK IN PLACE- INSERT TOP AND BOTTOM- INSTALL FIREWALL THEN SHAPE
BEVEL EDGES OF FIREWALL TO MATCH BLOCKS AFTER CARVING
LENTH TO VEE 9 3/8"
2 5/8"
SOLDER WIRE
TUBE
3/4"
FIN
1/4" SHEET
1/8" SHEET
BAND FROM DOOR TO DOOR
VARY INCIDENCE PACKING TO SUIT
PLY
CABIN TOP CENTER
1/2" SQ.
1/4" X 1/2"
3/16" DOWEL
3/8"
1/4" GUSSET
1/4" X 5/16"
2 3/8"
2 1/2"
3/16" SQ.
1/16" SHEET TOP AND BOTTOM
3/4" X 1"
1/32" WEB
1"
13"
3/32" RIBS
3/7/8"
2 3/8"
7/8" X 1/4"
7 1/8"
HIGH CAMBER LINE
1/8" X 1/4"
3/32" SHEET
1/4" SHEET
5/8" TAPER TO 1/4"
1/4" SQ
1/16" SHEET
TUBE
1 3/8"
DOOR 1/8" SHEET
RECEIVER
6 3/16"
1/8" X 1/4"
ESCAPEMENT SWITCH
3/16" SHEET
1/8" SQ.
WEDGE TANK
1/8" X 1/4" FRAME AND STOPS
ACCESS DOOR AND FRAME OTHER SIDE
RECESS
TIMER
NYLON HINGE
3" SHEET
3 1/8"
NYLON COVERING OVER ALL WOOD SURFACES AND NOSE
2 PLY
1/8" SHEET
ANTENNA
COIL
SWITCH
JACK
1/8" BULKHEADS GRAIN CROSS SHIP
BOTTOM GRAIN
SOLDER NUTS TO BRASS
2 1/8
7 5/8"
BATTERY HOLD DOWN
1/8" BOTTOM CROSS GRAIN
RUBBER LINE 1" DIAMETER HOLES
LET SIDES ASSUME BEND BUT HOLD THIS DIMENSION
1/16" WIRE
3/32" NEGATIVE
1 3/8"
1/32" WIRE
CLOSE FIT
SPAR HOLES
BLOCK
GROOVE FOR WIRE AND COVER WITH NYLON
4 1/2
3/32" SHEET
TOP OF FUSELAGE
BATTERIES
2 3/4"
DOUBLE 1/8" WIRE
GRAIN
BOTTOM OF FUSELAGE
1/8" SHEET
GRAIN
3/32"
3/4" DEEP BLOCK
BIND .010 WIRE AND SOLDER
1/4" SHEET OVER BOTTOM
1/16" SHEET OVER BOTTOM
PLANS 1/4 SCALE BLOCK
ESCAPEMENT CELLS
1/8" DOWEL
39 1/2"

The Citizen

by William Winter

Clean simple lines are a feature of this small R. C. model

You won't need a truck to transport this compact radio control plane

PART ONE

THE *Citizen* is an attempt at a minimum-size airplane that would utilize the heavier, long lasting batteries (desirable for the use of a tube having long life, as in the Good Brothers receiver) which commonly are carried by planes 6' and larger. Primary considerations were smallest size consistent with the above, and with plane visibility at a distance (½ to ¾ mile), and construction that would survive the rugged flying typical of western New England. While the *Citizen-Ship* radio we used does employ hearing aid B batteries, the weight of the required A's balances things out.

Experience over a year's flying with an *Ohlsson 60*, 6½-foot semi-scale job (wing loading 18 oz.) had indicated a number of musts for this smaller design. An analysis was made of the *Rudderbug* which (with Gene Foxworthy's very excellent twin-tailed job) is the best all-round R.C. ship in the country today. If the *Citizen* seems to have been impressed by Walt Good's *'Bug*, it is because any serious effort to design an ideally practical ship keeps bringing you back to the same general layout. However, despite the *Rudderbug* motif, the *Citizen* is a rugged individualist and contributes some worthwhile data on performance and control characteristics at various power and wing loadings to be described.

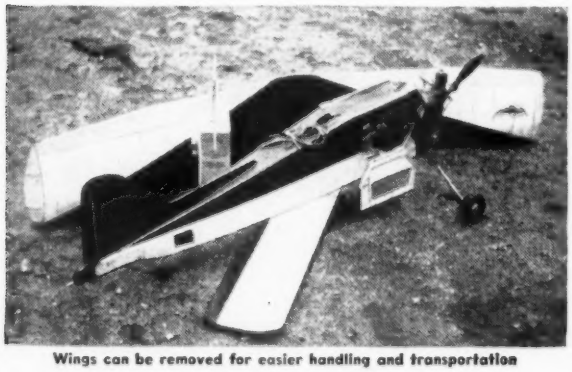
As the ship's name implies, the receiver and transmitter operate on the Citizens Radio band; Vernon C. Macnabb kindly supplied one of his three original test radios for our use. As this is being written a transmitter is before the FCC for possible approval which, if granted, would mean license-free (or more correctly, *examination-free*) operation. However the *Citizen* was designed also to take *Beacon*, *Aerotrol*, *RCH*, and similar equipment, and is not limited to any one make of radio.

The first question in designing a new radio control model is "how big?" Since the *Rudderbug* weighed 74 oz. gross it was felt that the minimum weight we could hope to attain with a sturdy small airplane, capable of toting a heavy B battery and not hearing aids, would be 60 oz. (Actually, the finished machine came in at 59 oz.) The *'Bug* has a wing loading of 12.3 oz. a square foot. Probably one failing of the *'Bug* is that it is *too* good and can vanish on a thermal. At the Nationals we had noted the remarkable glide of the Good design and had observed Dick Gelvin's job spinning in a thermal in a nearly unsuccessful attempt to get back to mother earth. Presumably, a smaller airplane would have less thermal riding ability but it was decided nonetheless to increase wing loading over the *'Bug* by about 2 oz. This gave a 56" wing with a 9" chord. (Consideration had been given to low aspect ratio to increase the rate of sink but too rapid a roll on use of the rudder soon killed the idea.)

A higher power loading was also decided upon. Most radio control jobs now perform with engines throttled well back, which means, of course, that the ships are overpowered or, more aptly, there is more power than can be successfully controlled. The *Rudderbug* has a power loading of about 247 oz. per cubic inch of displacement. This may sound like a lot to the average free flight man but it actually is a low figure. R.C. models are performing successfully with loadings up to and beyond 600 oz. A perfectly arbitrary figure of 300 oz. power loading was selected. This determined the use of the *Arden .199*. It was feared that glow ignition would result in too much power and a speed inflexibility that would prevent adequate adjustment, so spark ignition was installed.

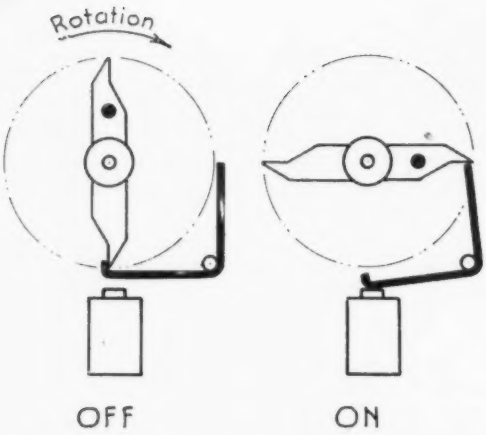
When the *Citizen* at first exhibited a high flying speed, extreme control response under power that threw the ship

(*Turn to page* 38)



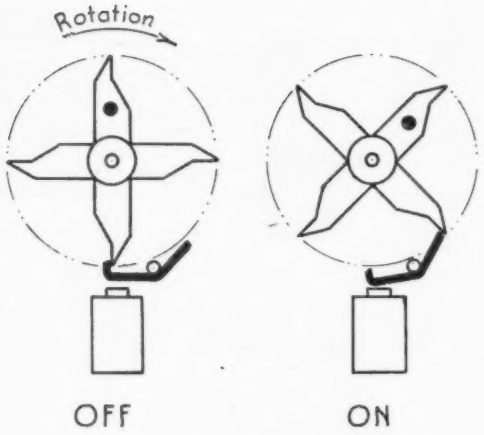
Wings can be removed for easier handling and transportation

Trap door near tail allows access to escapement rudder hook



TWO-TOOTH WHEEL

SEQUENCE	1	2	3	4
OFF	N		N	
ON		R		L



FOUR-TOOTHED WHEEL

SEQUENCE	1	2	3	4	5	6	7	8
OFF	N		R		N		L	
ON		½ R		½ R		½ L		½ L

Fig. 1 Comparison of common escapement sequences. (a) two-tooth wheel, 45° rotation. (b) four-tooth wheel, 22½° rotation

reliable escapements

by J. S. LUCK

THE escapement in a radio controlled plane is very seldom respected as it should be. Compared to the receiver or the transmitter it has very little electronic glamor. Yet, if the receiver is the brain of the controlled ship, then the escapement is the brawn which guides it.

Escapements in general use employ escape wheels with either two or four teeth. *Fig. 1* gives the sequence of rudder positions for both. The accepted method of stopping or locking the wheel at a required position is by means of a pallet similar to that of a standard clock escapement. The pallet is, in R.C. practice, the armature bent at either end, *Fig. 2.*

Assembly of wheel and pallets is a matter for critical study. Poor alignment, wrongly designed or faced pallets, and improper relationship between the wheel and armature pivots, *Fig. 3a*, are among the most frequent causes of escapement failure. However, the adjustment most frequently demanded on a badly behaving mechanism is concerned with the amount of lock given by the pallets; the pivoting layout is seldom incorrect in commercially built escapements. The lock must be deep enough to provide a positive stop, yet desirably fine in order to keep friction between escape tooth and pallet, and the gap between armature and pole-piece at a minimum.

PART ONE

The possibility of establishing an ideal relationship between pallet and escape tooth is materially dependent upon the quality of the mechanism to be adjusted. So perhaps the first step is to inspect the bearings of the armature pivot and escape wheel shaft. If they are sloppy, they should be corrected. Use a nail-set and give the pivot holes a smart tap. This tends to close up a worn hole which may then, if necessary, be drilled out to the correct size. A short length of piano wire, of the same size as the pivots, may be used as a drill.

Reassemble the unit and examine its operation. Referring to *Fig. 2*, compare its operation to the lock and clearances indicated. As the principle is the same,

(*Turn to page* 36)

Fig. 2 Ideal layout and action for R.C. escapement

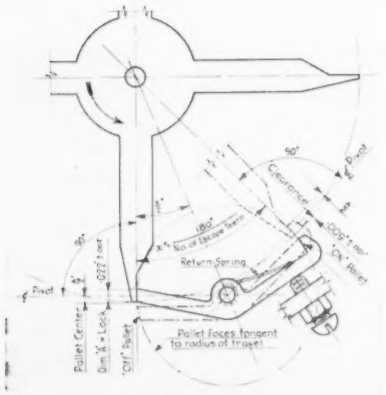
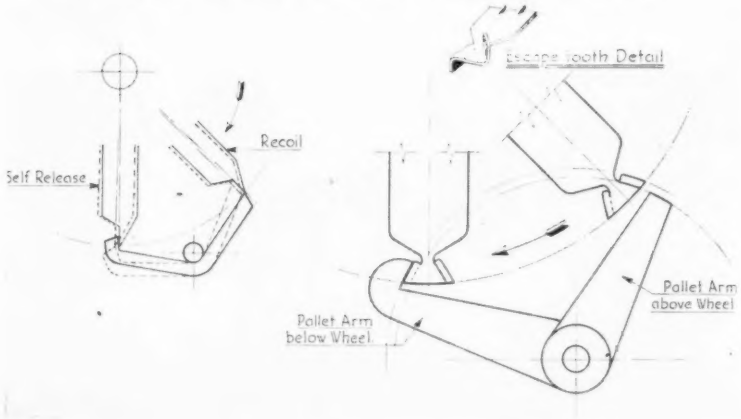


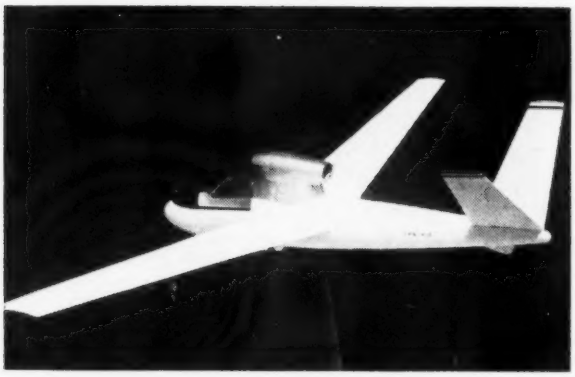
Fig. 3 (a) recoil from incorrectly faced pallets. (b) deadbeat pallet and wheel

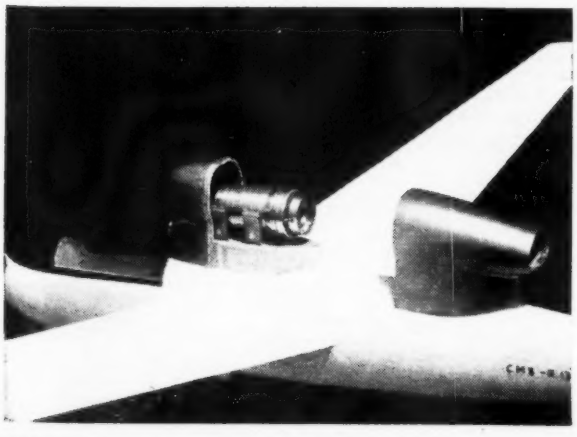


Fouga Cyclone Model

by J. H. MAXWELL

Here at last is a scale copy of a big plane ideally suited for jet use





GAS turbines are essentially high-speed engines, and therefore they are employed almost exclusively on high-speed aircraft—fighters, bombers, and the like. From the point of view of the flying scale enthusiast this is unfortunate, for modern high-speed aircraft rarely make successful flying scale models. Thus, the scale modeler was in the position of having at his disposal a series of efficient little jet units, but no suitable prototype to use them in. Recently, however, there has appeared an airplane which is not only jet powered, but is also ideal for scaling down. We refer to the Fouga *Cyclone*.

The *Cyclone* is basically a sailplane, to which has been fitted a *Turbomeca* gas turbine in a neat streamlined cowling. In addition, the normal tail surfaces have been replaced by a vee tail to give clearance for the jet. The result is an extremely clean and good-looking airplane.

Our model, which was designed to suit the small *Jetex 50* unit, is built to a scale of 2 inches equals 1 metre. (The prototype, being French, has its main dimensions in metres.) Scale proportions have been faithfully preserved, except for the following alterations which were made for practical reasons. The wing dihedral has been increased. The area of the vee tail has been increased. The width of the cowling has been increased to accommodate the *Jetex*.

Building the model *Cyclone* demands a little more skill than is required for the average small model, but it is an interesting task, and the handsome appearance of the finished model amply repays the time spent on it. The plans are reproduced full size.

Fuselage. The fuselage is a planked structure, which combines lightness with strength and realistic appearance.

Start by cutting the formers from quarter-sawn medium 1/16" sheet. The planks are of 1/16" x 3/16" soft balsa. Select two pieces to act as master planks. Lay these round the fuselage outline on the plan (top view) and mark on them the former positions. Cement the formers to the master planks in the following order, F2, F3, F1, F4, F5, and finally F6. Add the top and bottom planks, making sure that everything is in proper alignment, then fill in the other planks. Plank all over ignoring, at this stage, the cut-outs for cockpit, wing, etc. Sand until a smooth regular surface is obtained.

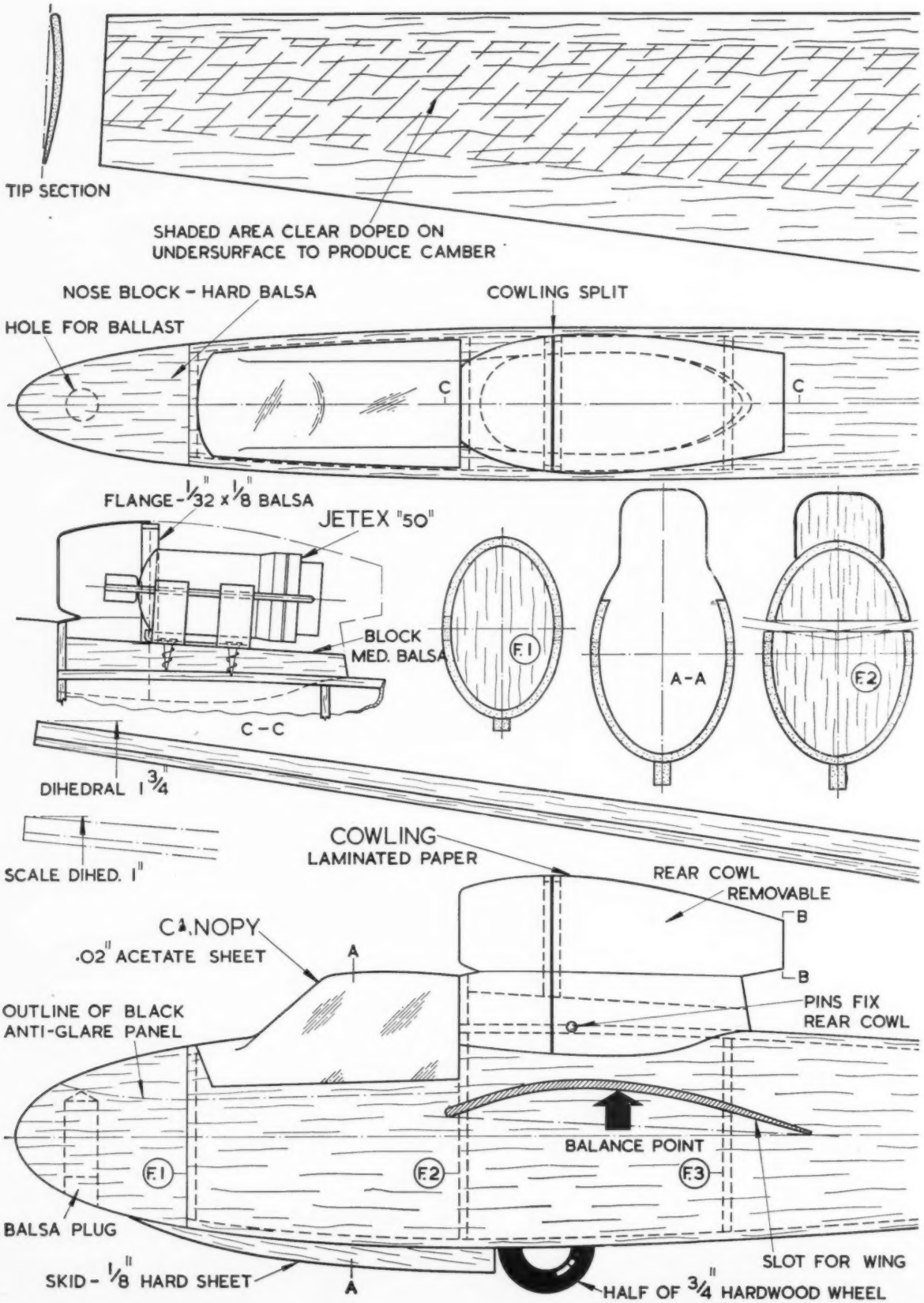
Use hard balsa for the nose block, medium for the block to which the *Jetex* is screwed, and soft for the tail block. The main skid is cut from 1/8" hard sheet, and the tail skid from 1/16". For the wheel, obtain a 3/4" diameter hardwood wheel, saw it in half and cement one of the halves securely to the fuselage.

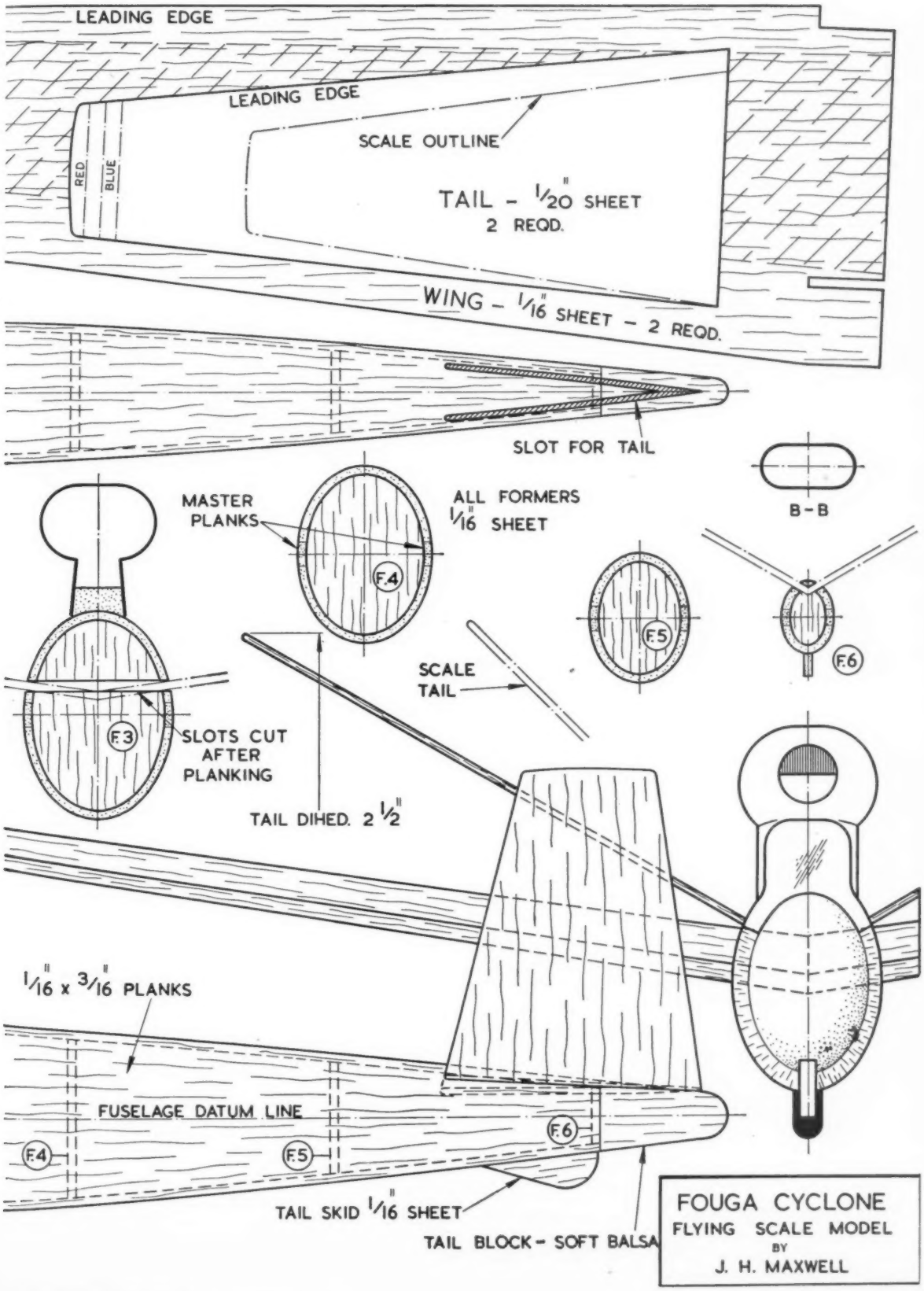
Cut the slots for wing and tail, also the cockpit cut-out. Use the centre of the master plank as the datum line when marking these cut-outs. Drill a 1/4" diameter hole in the nose block to act as a ballast box.

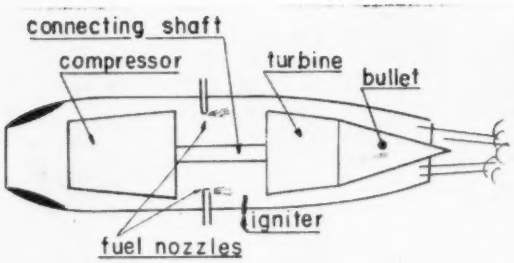
Canopy. It is unlikely that you will be able to obtain a commercial canopy of the correct shape, and therefore there is no alternative but to make one for yourself.

Carve the shape of the canopy in hard balsa. Sand this smooth, but do not dope. Mount this shape on a stand, such

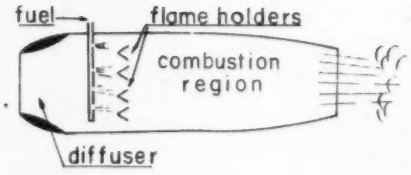
(*Turn to page* 44)


TIP SECTION
SHADED AREA CLEAR DOPED ON UNDERSURFACE TO PRODUCE CAMBER
NOSE BLOCK – HARD BALSA
COWLING SPLIT
HOLE FOR BALLAST
C
C
FLANGE – 1/32" x 1/8" BALSA
JETEX "50"
BLOCK MED. BALSA
C – C
F.1
A – A
F.2
DIHEDRAL 1 3/4"
SCALE DIHED. 1"
COWLING LAMINATED PAPER
REAR COWL REMOVABLE
B
B
CANOPY .02" ACETATE SHEET
A
OUTLINE OF BLACK ANTI-GLARE PANEL
PINS FIX REAR COWL
BALANCE POINT
F.1
F.2
F.3
BALSA PLUG
SKID – 1/8" HARD SHEET
A
SLOT FOR WING
HALF OF 3/4" HARDWOOD WHEEL

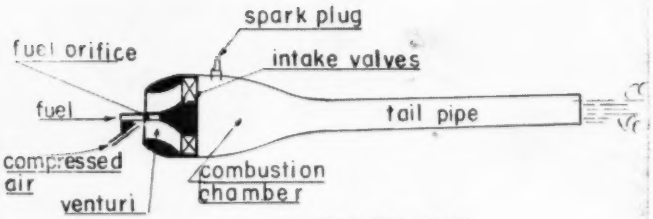

LEADING EDGE
LEADING EDGE
SCALE OUTLINE
RED
BLUE
TAIL - 1/20" SHEET
2 REQD.
WING - 1/16" SHEET - 2 REQD.
SLOT FOR TAIL
B-B
MASTER PLANKS
ALL FORMERS 1/16" SHEET
F.4
F.5
F.6
SCALE TAIL
F.3
SLOTS CUT AFTER PLANKING
TAIL DIHED. 2 1/2"
1/16" x 3/16" PLANKS
FUSELAGE DATUM LINE
F.4
F.5
F.6
TAIL SKID 1/16" SHEET
TAIL BLOCK - SOFT BALSA
FOUGA CYCLONE
FLYING SCALE MODEL
BY
J. H. MAXWELL



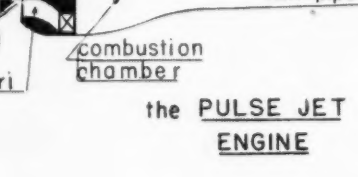
the TURBO-JET



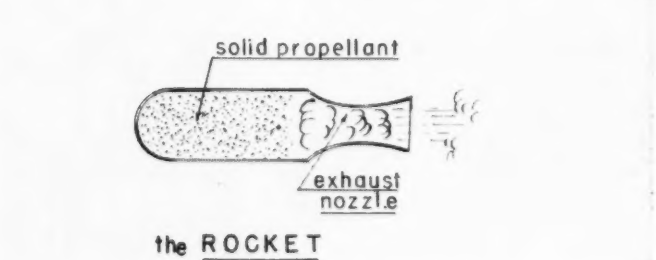
the Ram Jet



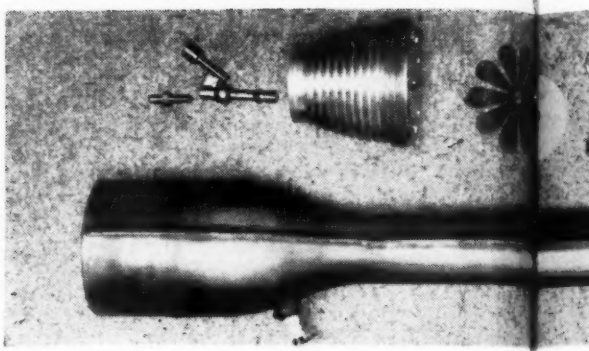
the PULSE JET ENGINE



the ROCKET



MODEL TURBOJET by G.W.Harris



Model Jet Engines

PART ONE

by J. H. LEMELSON

INVENTION and experimentation in the home workshop have been the common practice of model makers throughout the world. With few exceptions, most of the model engines and planes on the market today are the results of the tinkerings of the model plane enthusiast whose flair for design and construction is surpassed only by his curiosity.

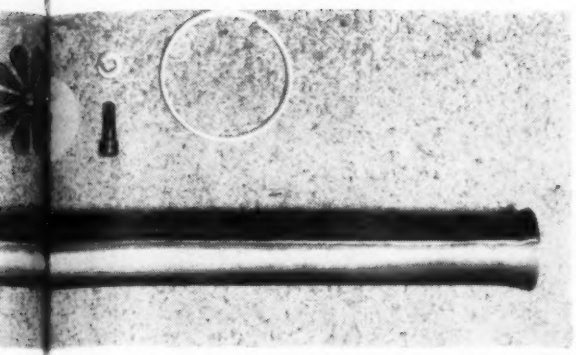
Both in America and abroad, the individual inventor and modeler (very often one and the same) have been experimenting with the new fascinating field of aircraft power, jet propulsion. The author has been able to gather some information on the four basic types of jet propulsion engines developed and produced in miniature so far by modelers throughout the world. These are (1) the turbo-jet, (2) the ram jet, (3) the pulse jet, and (4) the rocket. All four have been constructed and successfully run in small scale. To present a clearer picture to the reader who is not too familiar with the differences in the basic types of engines mentioned, a description of their present-day full scale use on aircraft and missiles will be followed by a description of the operation and construction of each.

The full scale turbo-jet has been used to power most of our present jet fighter and bomber aircraft. Such airplanes as the F-80, F-86, and B-45 *(Stratojet)* are powered by gas turbines, or turbo-jets as they are commonly called. The ram jet has had its greatest use as a prime mover for guided missiles. The pulse jet has also been used extensively on military missiles, the most famous being the German V-1 buzz bomb and its American counterparts, the Army's JB-2 and the Navy's *Lark* (KUW-1).

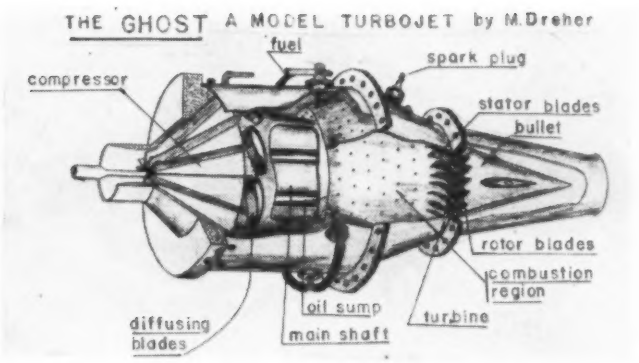
As a side-note, it might be mentioned that both the ram jet and pulse jet have been successfully utilized to drive helicopters by situating the jets on the blade tips. Present-day experiments are being carried out to utilize the engines as auxiliary power plants for man-carrying aircraft. The rocket has been used mostly to propel missiles such as the V-2, and experimental aircraft such as the supersonic Bell X-1.

Our discussion of model jet engines will be divided into two parts. Pulse jets and turbo-jets will be covered in this issue; the second article, on model ram jets and rockets, will follow in a succeeding issue.

Model Pulse Jets. The model pulse jet is the type



Here is a completely disassembled *Dynajet*



of jet most widely used by modelers in this country. The engine is relatively simple in construction, light in weight, and can be operated without too much difficulty after a bit of practice by the experienced modeler.

The pulse jet, also known as a resojet, buzz jet, aero-resonator, or aeropulse, operates on a pulse or intermittent explosion cycle. Whereas in the turbo-jet, ram jet or rocket, combustion is, for all practical purposes, a steady burning process; in the pulse jet engine, it consists of a rapid and continuous series of explosions occurring at a high frequency in the combustion chamber. A more or less steady thrust results from this phenomenon. The number of explosions occurring per unit time are determined by the length and diameter of the jet's combustion chamber and tailpipe, the amount of fuel flowing and the amount of air admitted per cycle through the intake valves at the head end of the engine. The design of a successful pulse jet is dependent upon the admission of the correct amount of air and fuel for the particular geometry of the combustion chamber and tailpipe. In most model pulse jet engines, the cyclic explosions occur at a rate of from 150 to 300 times per second and to the observer it appears as if the engine is putting out a steady uninterrupted blast.

The engine is relatively simple in design (Fig. 1). It consists of a conically shaped tube (combustion chamber) connected to a tailpipe. At the head end of the combustion chamber is a valve bank placed behind an intake venturi section. Fuel and air are usually mixed in the latter and introduced into the combustion chamber when the valves on the valve bank open. The valves, usually made of a light spring metal, open and close with each explosion allowing a new charge of air and fuel to enter the chamber. A spark plug is situated in the combustion chamber for starting.

Operation and construction of a typical unit are as follows; air rushes in through the intake venturi at the head end of the engine and mixes with a fine spray of fuel which is flowing from a nozzle or tiny fuel orifice at the throat of the venturi. The charge then flows through flutter valves and into the combustion chamber. The valves which are made of thin sheet steel (.005-.008 inch thick) are clamped to the intake bulkhead so that they cover intake ports which are drilled through the bulkhead from the venturi section. The charge is ignited in the chamber and the resulting increase in pressure closes the valves against the bulkhead cutting off the intake flow momentarily and preventing combustion gases from flowing in that direction. The burning gases, having only one direction in which to flow, are expelled through the tailpipe to the atmosphere at high velocities. As the gases shoot out of the tailpipe, a negative pressure is created in the combustion chamber and the valves open again allowing the next charge to enter. The cycle then repeats. Re-ignition is automatic so that once the engine is started, continuous spark plug ignition is not necessary.

The top officially timed controline speed record is today held by a *Dynajet*-powered model which was clocked at 179 mph in 1948. The power weight ratio for a pulse jet engine runs between 2 and 4 lbs., thrust per pound of engine weight which, at present, is greater than all other known model propeller-spinning or jet engines. The model rocket is the only other jet device which has promise today of approaching or outpacing the pulse jet in thrust per unit weight of engine.

The author has been able to gather some information about experiments carried on abroad with model pulse jets. Correspondence with Mr. Russ Watson-Will, of Brisbane, Australia, reveals that he has constructed a number of engines in attempting to develop a simple and successful unit for model aircraft power. At present, he is working on his third pulse jet, Mk. III. His first engine, Mk. I resembled the German V-1 pulse jet in shape since the only information he had at the time consisted of reports on the construction of the buzz bomb engine which he obtained while serving in the R.A.A.F. The head and intake venturi of the Mk. I engine was cast of duraluminum and machined to size. The combustion chamber, into which the head threaded, was machined from a solid rod of cast rolled steel, a practice which he did not repeat in his later models since he discovered that thinner and lighter walled combustion chambers could be made of alloy steel sheet. (Nickel steels are used in the commercial pulse jets manufactured in this country to resist the effects of the high combustion temperatures which may top 2000° F in the chamber.) The tailpipe of Mk. I consisted of a 16½" length of 1½" i.d. steel pipe which was welded to the tapered rear end of the combustion chamber.

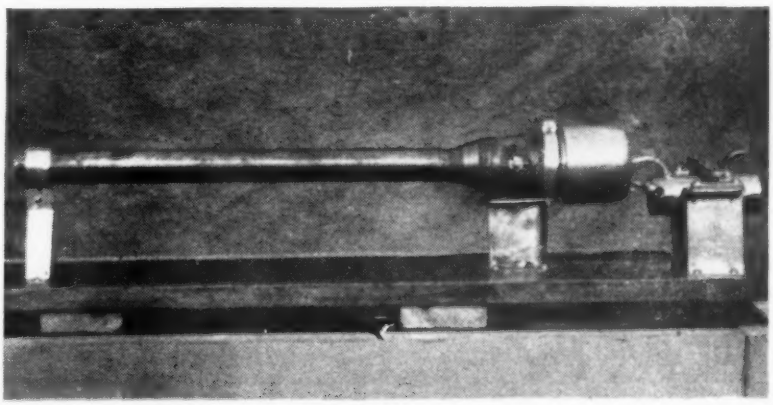
Russ tried practically everything from feeler gage stock to razor blades for air intake valves! The valves of the commercial model pulse jets are made of clock spring steel .005 to .008" thick, some of which has recently been used by Russ on his latest engine. The other materials rapidly deteriorated, probably because of their quality and the valve design. Perhaps the most efficient pulse jet valve designed to date is the petal valve. It is shaped like the petals of a flower, each petal covering an intake port. Held in place by an aluminum disc which is bolted to the intake head, the valves ride on the curved inner surface of the disc as they vibrate during operation. This allows the valve petals to absorb more shock than if they were just bolted to the bulkhead. Tests made without the aluminum disc showed that the valves snapped off quickly after a short run.

Mk. III, Russ's latest engine has just been completed and is undergoing tests at present. It incorporates a number of design features of the two pulse jets which have appeared on the American market.

Colonel C. E. Bowden, of England, has completed a free flight flying boat powered by a *Dynajet* engine (M.A.N., January, 1949, page 30) though no information is available as to its performance.

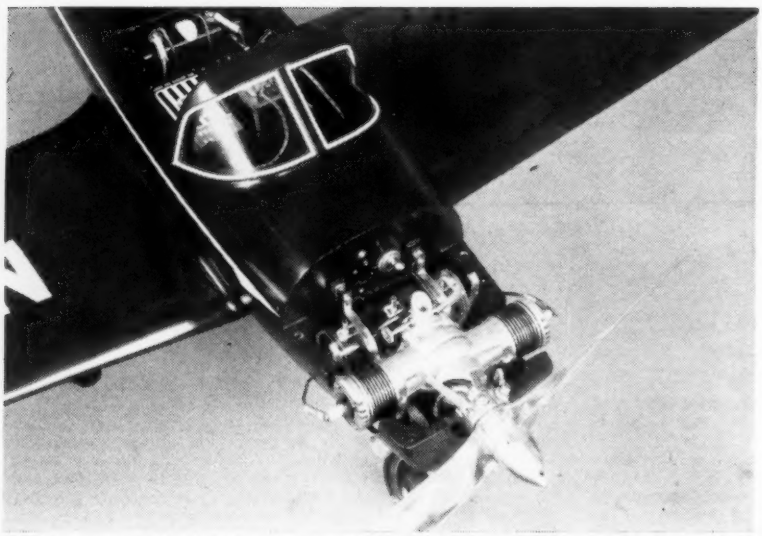
(*Turn to page* 50)

R. Watson-Will was unable to procure a jet engine in Australia, so had to build this one



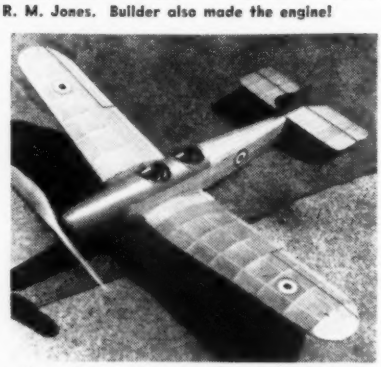
air ways

News of Model Airplane Experimenters From All Over the World

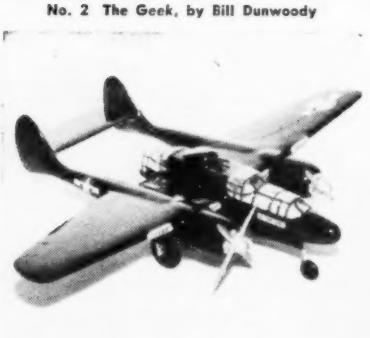


No. 1 Nose of outstanding scale *Navion* by R. M. Jones. Builder also made the engine!

No. 2 The Geek, by Bill Dunwoody



No. 3 Rubber scale *Magister* by C. Chapman



No. 4 "No name" built this neat *Black Widow*

No. 5 R. Neidhart sent pic of Swiss modeler

No. 6 James Schenck feels Piper PA-11 is an ideal subject for scale modeling

THE LATEST IDEA in unusual contests to reach this office was revealed to us by Lytton Calrow, secretary of the *Association of Twin Cities Hobby Retailers, Inc.*, of St. Paul, Minn. Like many other groups throughout the country, this Association is endeavoring to interest the younger model plane builders and to encourage more youngsters to engage in model flying. Mr. Calrow's group has gone farther than many, however. They have incorporated their ideas into the Association's four-year program for improving the dealer situation in Minnesota, and have devised a new sort of contest to help the beginners. This is called a "Talent Scout Contest" and is sanctioned by the AMA. The contest is to be held May 21, 1950, and entrants who send in their registration before May thirteenth will not be charged an entrance fee. The age limit is set at 17 years, and all boys and girls under this age are urged to enter.

The novel twist in this contest is the introduction of the Talent Scout; these Scouts are simply experienced fliers who are asked to pick out a likely youngster, help him to ready models for all events to be entered, and act as the young flier's mechanic on the day of the big Meet. Talent Scouts may back more than one flier. To encourage both the actual winning fliers and their respective Talent Scouts, prizes will be given to both. with trophies and prizes for the flier, and a five-dollar merchandise coupon awarded to the Scout for each first place his Junior wins.

The free flight events will include rubber, towline gliders from 100 to 200 sq. in., and gas powered ships up to .306 cu. in. Controline will have stunt, and speed also limited to .306. AMA rules will be used throughout, and a comprehensive retriever setup with short wave radio has been arranged. It is probable that CO2 events will also be flown.

This double-barreled scheme should encourage both Talent Scouts and Juniors to join in the fun, for Scouts are expected to locate promising Juniors and train them for the Contest, and Juniors are urged to seek Scouts for themselves. The outcome of this undertaking will be watched with interest, for it can't help but aid in the endeavor to attract more youngsters to active modeling.

FREE SCALE PLANS of many of the latest Navy planes were announced by the

No. 7 Unusual canard glider pic from B. Fairey

No. 8 Two ambitious scale modelers were snapped by Chas. H. Thomas

Navy at the Nationals in Olathe last summer. We are informed that the list of these free plans has been expanded, with the following types now available: XF8F-2 *Bearcat*, P2V-2 *Neptune*, AM-1 *Mauler*, AD-2 *Skyraider*, D558-1 *Skystreak*, XFJ-1 *Fury*, F2H-1 *Banshee*, and XF9F-2 *Panther*. The plans are in the form of three-view drawings, showing external characteristics, marking details, fuselage and wing cross sections, and major dimensions. The plans vary slightly in size, but all are printed on 17" by 22" sheets. They may be obtained *gratis*, by writing to—Lieutenant John H. Burton, USN, Pentagon Building, Room 4C742, Navy Public Relations, Washington 25, D. C. These plans are well worth writing for; the scale builders will find them useful, and need we add that coming from the Navy which uses all these airplanes, the plans are *authentic*.

* *

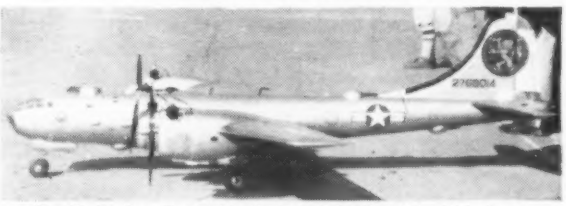
Our first photograph this month shows the nose of a beautiful scale *Navion* which was constructed by R. M. Jones (The Liquid Carbonic Corporation, 3100 South Kedzie Avenue, Chicago 23, Illinois). As can be seen from the portions of the ship in the picture, this airplane has a top-grade finish. Of even more interest to readers, however, will be the fact that the twin-cylinder engine was also constructed by Mr. Jones. At the time the photo was made, the plane had not yet been flown but the engine had already been run for many hours. The displacement is .2 cu. in. for each cylinder (.4 cu. in. total) and the engine is fitted with a two-speed timer and runs like a dream. Notice the neat plastic fuel tank fastened on the firewall just behind the engine.

The free flight boys are represented this month by Mr. Bill Dunwoody (130 Eighty-fifth Street, Brooklyn 9, New York) who built the *Geek* which appears in our second photo. This model has a span of 56", and 420 sq. in. wing area. It is powered by an *Arden .199*, using glow plug and a simple fuel cut-off system; a dethermalizer is also included. Bill is a member of the *Hot Heads*, a club of about twenty ardent gas modelers who meet every Friday evening in the basement of his house. Despite the club's name, members are interested in all forms of gas, rubber, and glider flying, and their ages range from 15 to 40.

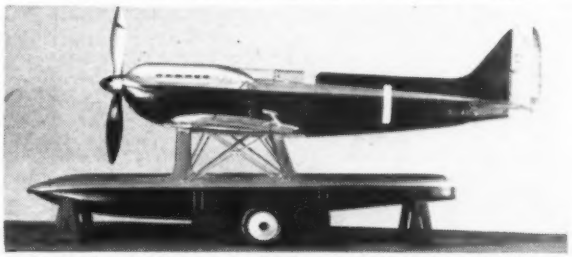
Photo No. 3, which shows a very attractive rubber scale model, was submitted by Mr. C. P. Chapman (2628 North Central Park Avenue, Chicago 47, Illinois). The Miles *Magister* plane appears to be ideal for this sort of flying. This particular airplane has a wingspan of 26" and the ship was built from plans by Earl Stahl which appeared in the February, 1942, issue of MODEL AIRPLANE NEWS. Mr. Chapman writes that he is a scale model enthusiast and at the time he wrote us he had a Travelair Mystery Ship and a Fokker D-8 on the worktable. Many of his scale jobs are free flight types, even those powered by gas motors. With the advent of the new midget type of engines, he expects to dispose of all his larger ships and concentrate on the tiny ones.

Illustration No. 4, which shows a very handsome P-61 *Black Widow*, was built by a modeler who neglected to sign his name but remembered to include his address (45 Salem Road, Rochester 9, New York). He wrote that the plane has a 16-1/2" wingspan and was finished off with several coats of glossy black, trimmed with silver. (*Turn to page* 48)

No. 9 Dave Foxcroft's latest free flight job held aloft by wifey

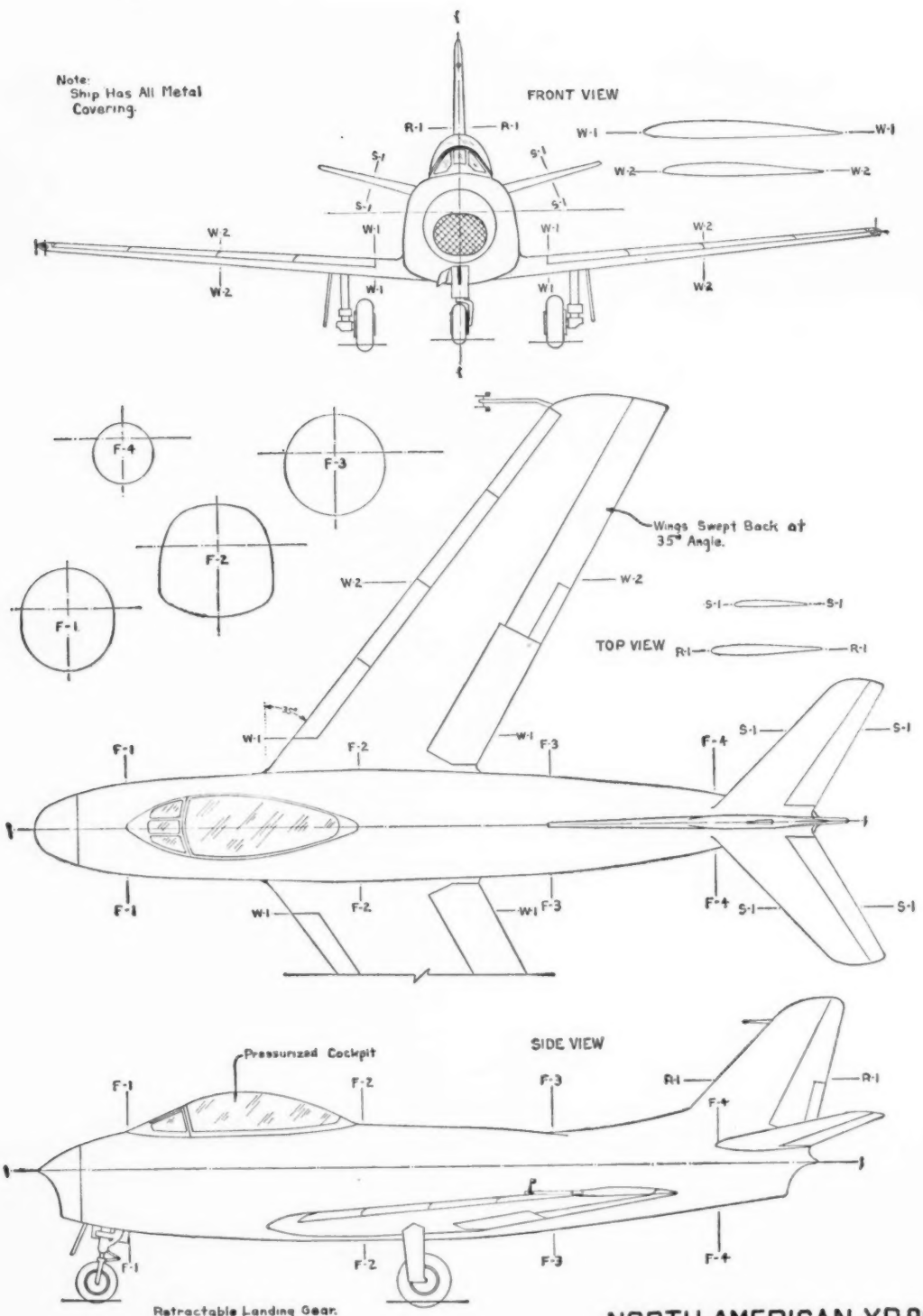


No. 10 Pic from Bud Kosby shows scale B-29 built by GI in Japan



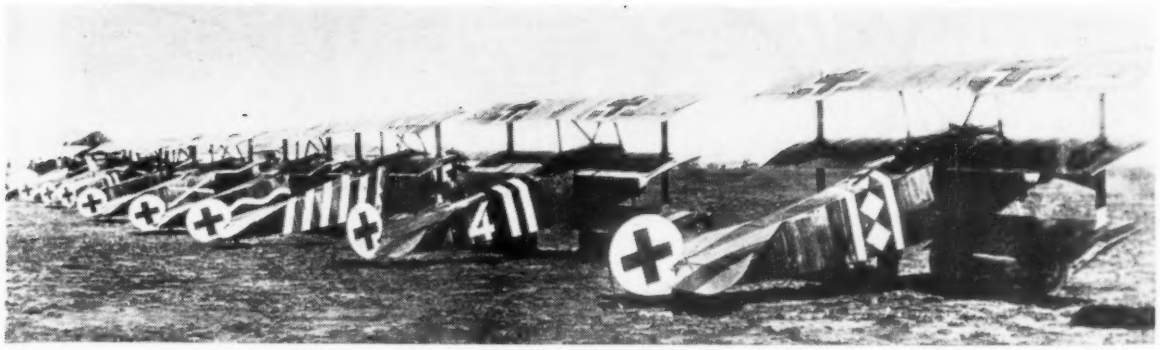
No. 11 Beautiful Supermarine S.6.B. model is work of Ian W. Moore

No. 12 Anton Huber specializes in exhibition models—this is a Swiss C-35



NORTH AMERICAN XP-86

SPAN	37 feet
HEIGHT	9 feet
LENGTH	37 feet
SPEED	670 + M.P.H.
RANGE	1,000 + Miles
HORSE POWER	4,000 + H.P.



Line-up of colorfully decorated Fokker Triplanes at the Front in mid-1918

WORLD WAR I

by ROBERT C. HARE

ABOUT 7:30 a.m. the morning of September 2, 1917, an English R. E. 8, with Lieutenants Madge and Kember of the Sixth Squadron aboard, was cruising back and forth in the vicinity of Zonnebeke, on the German side of the lines. The crew of the "Harry Taite" was looking for likely artillery targets. The sky was clear, the autumn air warm, the countryside below peaceful.

Twenty minutes later Madge and Kember saw a group of planes approaching from behind the German front. They watched nervously for a moment, then relaxed when they noticed the lead machine was a triplane—probably one of the Royal Naval Air Service boys in a Sopwith "Tripe" taking a gander at the war with some R. F. C. compatriots.

The five single seaters approached the R. E. 8 more closely, then the lead ship—the triplane—dropped down closer. Kember, the observer, watched casually. One hundred fifty feet from the R. E., the triplane opened fire and the two-seater spun to a rending crash on the earth below.

Lieutenant Madge never knew what hit him; although Kember survived, he probably never found out that they were No. 60 on Manfred von Richthofen's victory list. Moreover, they and their plane were the first recorded victims of a Fokker Dr. I triplane.

The next day, von Richthofen tried his new triplane for the second time, shot down victory No. 61—Lieutenant Bird, in a Sopwith "Pup"—after a hard fight ranging from 10,000' to the carpet. Afterwards, the German ace wrote: "The Fokker F.I. 102/17 was undoubtedly better and more reliable than the English machine."

In a way, that was an understatement. In subsequent months, the Fokker Triplane proved to be one of the most devastating ships of World War I, not because it was faster or more heavily armed, but because its maneuverability probably never was equalled in any airplane constructed before or since.

FOKKER TRIPLANE PART ONE

DESIGN. Although the official German designation for a triplane was Dr. I (for Dreidecker—three winger), the above reference to von Richthofen's Triplane calls his ship a Fokker F. I. According to some sources, that designation was Fokker's own, and the Red Knight's plane was a present to von Richthofen from Fokker, personally.

Whatever the case, the Fokker Dr. I was the result of Fokker's attempt to go to one of two extremes: either make a plane *so fast* it couldn't be hit, or *so maneuverable* it couldn't be hit. He chose the later extreme for two additional reasons: Fokker figured that the ultimate test of victory occurred in the few minutes that German and Allied planes actually engaged in "dog fighting." At that stage in an air battle, keeping out of the opponent's gun sights was as important as getting him in position for a kill, and the most maneuverable plane had the advantage. Fokker's second reason was one of supply. Because of certain political conditions between the German Air Service procurement authorities and engine and plane manufacturers, he was unable to get delivery on engines powerful enough to produce a really fast airplane.

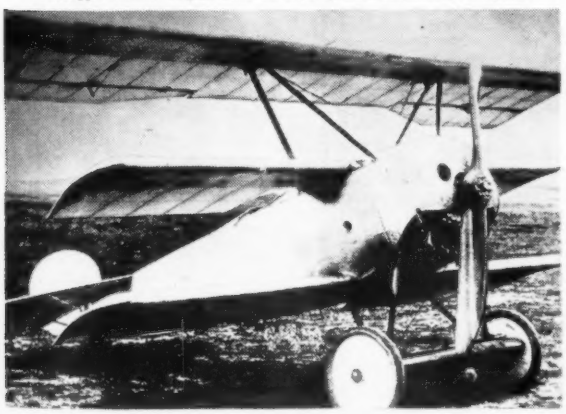
His sole supply was a batch of 110 hp le Rhone rotary engines which had been obsoleted for first-line fighters and were in storage for training purposes.

So while his competitiors went ahead with superstreamlined fighters, built to exceed the speeds obtained by such ships as the French Spad, Fokker sat down to his drawing board to solve the problem in his own way.

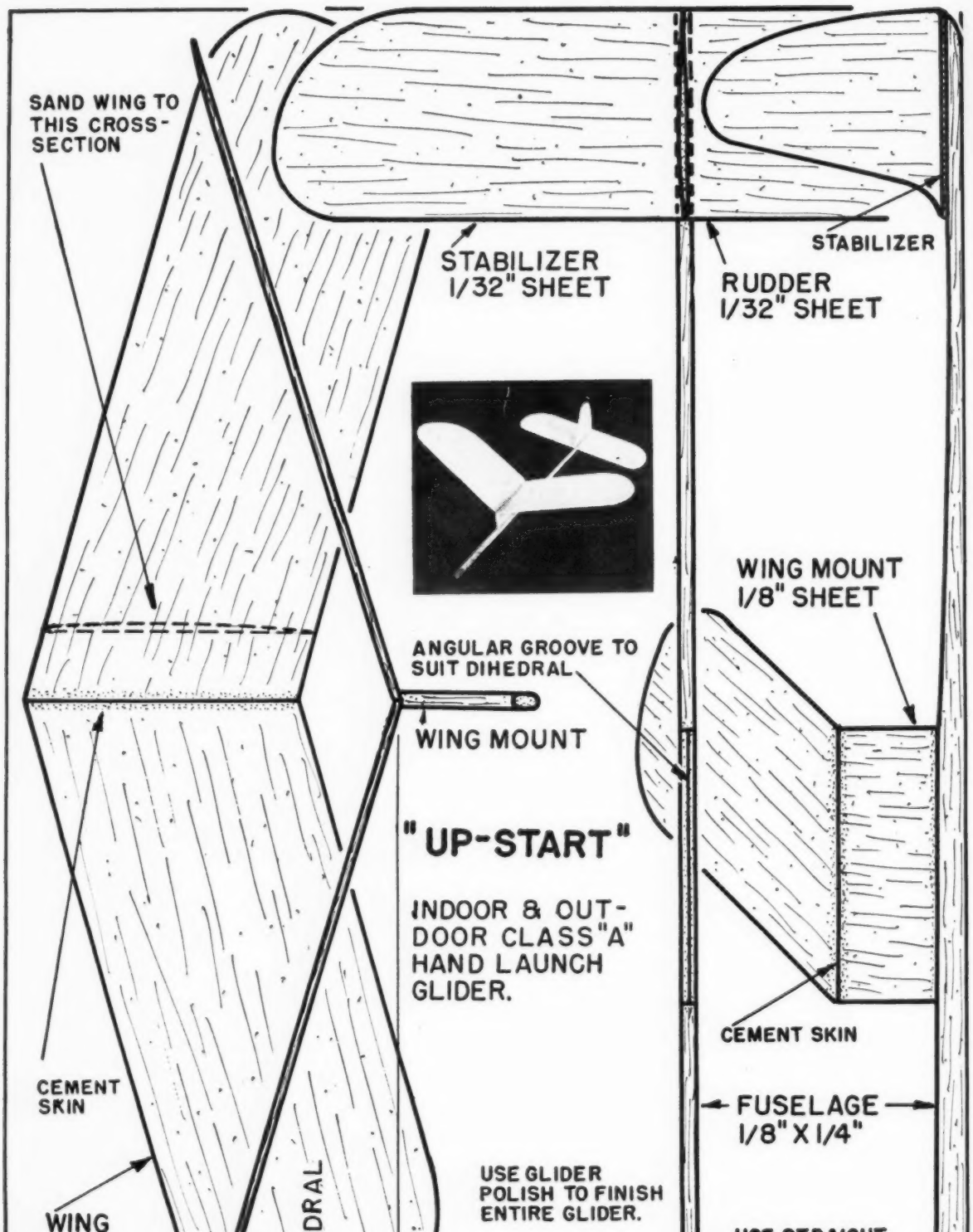
His principal element was the available power plant, the 110 hp le Rhone (built under license in Germany by Oberursel, which Fokker controlled). Because of its power and its very short length the engine indicated a light, very small airplane. The weight distribution of the rotary permitted a normally short moment arm for the tail, which was an essential of extreme maneuverability, in a normal airplane. Fokker exaggerated this by dividing the necessary wing area into three

(*Turn to page* 46)

Prototype Fokker *Tripe*, with no struts, and unbalanced ailerons



Captured by French, this Triplane received a Nieuport cowling


SAND WING TO THIS CROSS-SECTION
STABILIZER 1/32" SHEET
STABILIZER
RUDDER 1/32" SHEET
WING MOUNT 1/8" SHEET
ANGULAR GROOVE TO SUIT DIHEDRAL
WING MOUNT
"UP-START"
INDOOR & OUT-DOOR CLASS "A" HAND LAUNCH GLIDER.
CEMENT SKIN
FUSELAGE 1/8" X 1/4"
CEMENT SKIN
WING 1/16" SHEET
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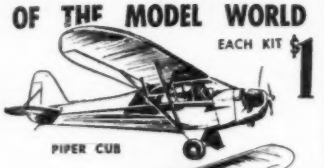

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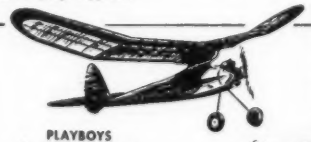

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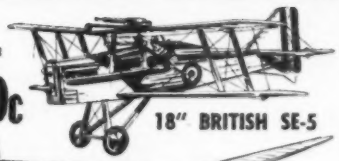

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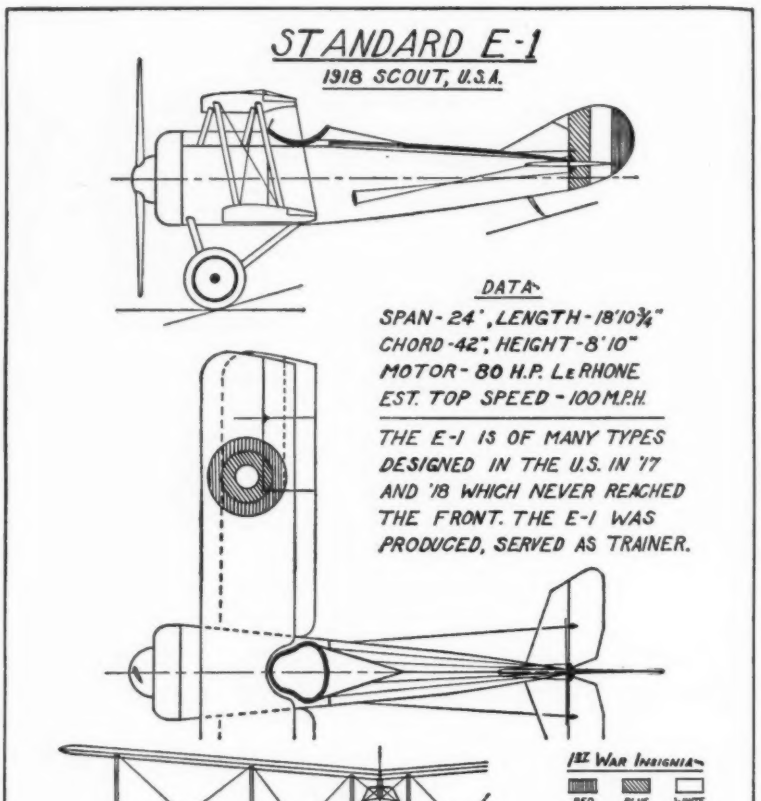
STANDARD E-1
1918 SCOUT, U.S.A.
DATA
SPAN - 24', LENGTH - 18'10¾"
CHORD - 42", HEIGHT - 8'10"
MOTOR - 80 H.P. LE RHONE
EST. TOP SPEED - 100 M.P.H.
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1ST WAR INSIGNIA
RED
BLUE
WHITE
SCALE
0 1 2 3 4 5
¼" = 1 FOOT.
(7) DRAWN & TRACED BY - Joseph H. Werry -

Reliable Escapements

(*Continued from page 24*)

regardless of the number of teeth in the escape wheel, only a four-toothed unit is illustrated. All is lost at this point if the escape wheel does not run dead true. The teeth must describe the exact same diameter, or, if that is too loosely put, a tolerance of plus or minus .001" is all that could be allowed. To begin the process of alignment: hold the armature in contact with the pole-piece, then adjust until the tooth clears the "on" pallet by about 8 to 10 thousandths (use a set of feeler gauges if available). The pole-piece itself, acts to limit the travel. Rotate the tooth until it touches the "OFF" pallet and adjust until the lock is about 20 to 24 thousandths. This entails firm, but delicately precise, bending of the armature with a pair of strong long-nosed pliers. Move the pallet until it clears the locked tooth by 8 to 10 thousandths and see that its travel is limited to this point. A set screw is sometimes provided for this purpose, or else there is a piece of metal placed so that it may be bent until the desired clearance results. Smooth and polish the faces of pallets and teeth. The clearance between the pole-piece and armature should now be about 32 thousandths (something close to 1/32"). Even finer measurements are practical if the bearings, wheel, and pallets are close to perfection.

The next point to study is the action of the wheel as each tooth is released and then stopped. Preference to *Fig. 3a* makes it quite obvious that if the pallet faces are not tangent to the arc of their travel, the wheel will either move forward or backward, according to the pallet angle, as the release is in process. In itself this is no serious fault, and could be ignored except for the fact that the coil must exert sufficient pull not only to overcome surface friction but also push that wheel back against the torque of the rubber bands driving it. The correct name for this type of escape action is "recoil" and it is commonly used in mass produced clock movements. Better clocks employ what is called a "deadbeat" escapement; and that is what we should strive for. The escape wheel should remain perfectly stationary as the tooth is being released. Proper facing of pallets will ensure this, but it requires almost microscopic inspection and refinement to attain the ideal. At the same time, proper relationship between armature and escape wheel pivots, and armature pivot and escape tooth contact face, should be as closely correct as possible. The exact relationships may be established according to *Fig. 2*. But if the escape tooth—armature pivot relationship is much greater, special treatment of the escape teeth may be required for ideal "deadbeat" operation. A solution for such a condition is shown in *Fig. 3b*. It is not simple and may require new wheel and armature.

Lacking patience, the best alternative is to err on the right side. The locking pallet when the coil is energized, i.e., the "ON" pallet, could be slightly "self-releasing." That is, the angle of the pallet is such that the torque of the rubber motor which is holding the locked tooth against the pallet is utilized, to a very small degree, in forcing the pallet to release as soon as the coil is de-energized. However, it must be emphasized that this self-release condition must be barely perceptible: for, if it exists to any marked extent, the tooth, which approaches with considerable force and speed, can easily knock the pallet aside before the coil has fully attracted the armature, and so continue right past. This condition is one of the most commonly seen failures at any R.C. contest, and is aptly dubbed "skipping" (another cause of skipping, nothing to do with the escapement, is a weak or chattering contact at the receiver relay).

If it is important to keep the self-release action of the energized stop at the very barest minimum; it is doubly true for the locking pallet when the coil is inert. The armature return spring alone must then prevent the approaching tooth from knocking the locking pallet from its path; but, if the spring is too strong, the coil has an excessive and needless additional force to overcome. The best compromise for the ideal "deadbeat" condition would be to reduce the surface of the pallet to within aces of becoming a knife edge. However, that is not too good from the viewpoint of resistance to wear and distortion from the continued hard impact of the escape teeth. If, on the other hand a "Recoil" action is allowed to take place, the coil again is taxed by the torque of the rubber drive, and may be quite incapable of pulling the pallet away from the tooth without greatly increased voltage.

The armature return spring is functioning correctly when the tension is just sufficient to return the armature with a sharp positive click. It is essential to avoid a sluggish return action under load, but it is equally poor practice to expect the spring to overcome excessive friction at the pallets, torque of the escape wheel (as in "Recoil" action) and a "sticky" pole-piece. This last is due to a small degree of magnetism remaining after the coil has become inert. The remedy is to coat the pole-piece or armature with a film which will not easily flake or chip. Shellac is excellent under normal conditions, but if the coil is allowed to heat up (more common to 2-toothed escapements), the shellac may melt and *really* stick armature and pole-piece together. Friction between teeth and pallets is kept to a minimum by careful surfacing. Coarse finishing is done with a needle file of "fine" cut. The faces are then further surfaced with a well-worn file and finally burnished with a highly polished piece of steel. Great care being taken in this last process not to distort either pallet or teeth. In place of burnishing—admittedly a highly delicate operation demanding practice and skill—a few touches with a smooth Arkansas ("Washita") stone should be satisfactory.

Some means must be provided to complete the magnetic circuit. The usual way of doing this is by returning the pole-piece to the armature.

Weight conscious enthusiasts have been known to cut away this return magnetic conductor as it just looks like so much useless metal. The efficiency of the coil is thereby drastically cut. Furthermore, it is useless to substitute a nonmagnetic metal, such as aluminum or magnesium, for this all-important part of the circuit.

To insure greatest possible pull from any given coil the reluctance must be reduced to a minimum. "Reluctance" in a magnetic circuit is the same as resistance in an electric circuit. Reluctance increases with the gap between pole-piece and armature, and the attracting force is reduced as the square of the gap.

Far from being just a "poor relation" the escapement is, and should be, an important part of radio controlled flight: it is a precision instrument worthy of careful attention. Keep this text available as references will be made to it in Part Two.

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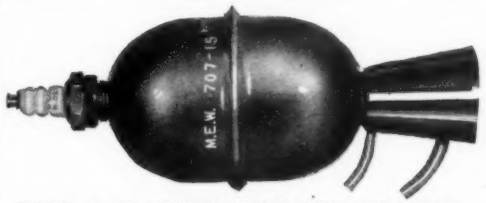

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1/16x1/8	1c	1/4x3/8	4c	1/32x2	8c
1/16x3/16	1 1/2c	1/4x1/2	6c	1/20x2	8c
1/16x1/4	2c	1/4x5/8	7c	1/16x2	8c
1/16x3/8	2 1/2c	1/4x3/4	8c	3/32x2	10c
1/16x1/2	3c	5/16 sq.	5c	1/8x2	10c
3/32 sq.	1c	3/8 sq.	6c	5/32x2	12c
3/32x3/16	2c	3/8x1/2	8c	3/16x2	14c
3/32x1/4	2 1/2c	1/2 sq.	9c	1/4x2	16c
3/32x3/8	3c	3/4 sq.	15c	5/16x2	18c
3/32x1/2	3 1/2c	PLANKS		3/8x2	20c
1/8 sq. 3 for	5c			1/2x2	22c
1/8x1/4	2 1/2c	1x3	$ .55	1/32x3	13c
1/8x3/8	3c	1x6	1.10	1/16x3	13c
1/8x1/2	4c	2x2	.80	3/32x3	16c
5/32 sq.	1 1/2c	2x4	1.25	1/8x3	16c
3/16 sq.	2c	2x6	1.80	3/16x3	22c
3/16x1/4	3c	3x3	1.50	1/4x3	25c
3/16x3/8	3 1/2c	3x6	3.00	3/8x3	31c
3/16x1/2	5c	4x4	3.50	1/2x3	34c
		4x6	4.25		

Beveled balsa trailing edges, 36" lengths

3/32x3/8	3c	5/32x5/8	5c	7/32x3/8	7c
1/8x1/2	4c	3/16x3/4	6c	1/4x1	8c

Propeller Blocks

8x7/8x1-3/16	8c	1-3/4	24c	18x1-3/4x2	32c
10x1x1-1/2	10c	9x1-1/2x2	15c	**Glider Wing Section**	
12x1x1-1/2	12c	10x2x2-1/4	25c		
14x1-3/16x1-3/4	18c	16x1-1/2x2	26c	3x3/16x20	18c

Cognet tube cement ..... 10c & 25c
Testor A or B cement ..... 10c & 25c
Clear Dope ..... 1 oz. 10c, 2 oz. 20c, 8 oz. 50c
Thinner ..... 1 oz. 10c, 2 oz. 20c, 8 oz. 50c
Colored Dope ..... 1 oz. 10c, 2 oz. 20c, 8 oz. 65c
Red, Orange, Yellow, Green, Lt. Blue, Metallic Red, Metallic Blue, Black, White, Silver, Olive Drab
Music wire ..... 3 ft. .020 & .030, 3c; .035 & .040, 4c; 1 lb. 5c; 3 32, 10c; 1 8, 15c
Silkspan, White ..... OD, 5c sheet; GM, 10c; 3 for 25c
Jap Tissue, Red, Yellow, Blue ..... 2 for 15c
G-M Tissue, White, Red, Yellow, Blue ..... 10c, 3 for 25c
T-56 rubber, per ft. 1/32, 1/16, 3/32, 1/8, 1c; 3/16, 1 1/2c; 1/4, 2c
Aluminum tubing, per ft. 1/16, 3/32, 10c; 1/8, 12c; 3/16, 15c; 1/4, 18c
Brass tubing, per ft. 1/16, 12c; 3/32, 14c; 1/8, 16c; 3/16, 20c; 1/4, 24c
Plywood sheets 16x12; 1/16; 3/32; 1/8; 3/16; 1/4 30c
Cellulose acetate sheets ..005, 10c; .010, 20c; .020, 30c
Testor carved balsa propellers
12", 14" & 16" dia. ..... 50c ea.
Jasco rubber lube ..... 1 oz. 15c
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Prop hook ..... small 5c; med. 5c; large 5c
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The Citizen

(*Continued from page 23*)

from one spin into another and back again, and a rate of climb that would have put the plane far too high after a long run, an interesting experiment was made with an *Arden .099* for power, still on ignition. With the .09 winding up a low-pitch propeller, the *Citizen* still flew fast for R. C., but was incapable of more than a barely discernible climb. Quite obviously, 600 oz. of power loading, generally speaking, would permit maneuvering speed without excess altitude. Had glow ignition been used the climb with the small engine unquestionably would have increased to an amount acceptable for open area flying where high obstacles did not have to be cleared. Bear in mind that the wing loading was 14 oz. Each ounce that could be pared off this figure would increase the climb on an .09. At 10 oz. of wing loading, a very nice slow flying machine would have resulted, though light construction would be required at power loadings of around 500 oz. At 12 oz. a passable machine can be designed for an .09. It is suggested that Aerotrol (etc.) owners can operate the *Citizen* successfully on a glow-plugged .09. Weight saved in radio batteries, and ignition equipment, will result in proper climb and gentle control response.

If the size of airplane, and its workable wing and power loadings, are known in advance from experience, so that the glow engine can be used at its natural running speed with a specific prop, then a glow engine proves desirable. The *Citizen*, when equipped with heavy batteries, apparently would fly and climb slightly with an .09 on glow; if its .199 was glow-operated we shudder to think of the wild performance that would result.

During tests to find a prop that would be "sufficiently inefficient" for the .199 so that the plane could be controlled with a good engine speed, the *Citizen* had been adjusted for straight power flight with some wide-blade 12-5's, cut down from old 14-4 *Invaders*. This, we found, was barking up the wrong tree. Anyway, a further switch was made to *Ohlsson* 11-4's. The timer arm had been locked in a well-retarded position (in fact, it was the starting position with the *Invader* props) and the needle valve was tuned to one turn open. Expecting more thrust, the timer was further retarded. The ship raced around in a wide left power turn, and soon began a progressive nosing up through the minute or two following. With torque taking an effect, left rudder action was dangerously increased, but right rudder affect was so weak that the ship could not be held into the wind encountered at high altitude, and an out-of-control flight resulted. So, if you are impatient with the radio boys as stick-in-the-mud's, consider this incident just one of several things that could happen as a result of too much speed and/or control. We got the ship back, though other possibilities could have washed it out. But more of these anon.

What shape should the plane take? How should it be built? Of what materials? Taking first things first, it is well known that a very high thrust line is desirable. This decreases nosing up tendencies under power and minimizes the down thrust required to offset such tendencies. It also means more prop clearance and fewer snapped blades in inadvertent nose overs. Walt Good demonstrated an important feature when he placed the vertical tail of the *Rudderbug* in such a position that it was roughly bisected by the thrust line. Walt long ago had told us his observation that a low fin area seemed to result in straight ahead power flights, while a high tail had a turning tendency due to the slip-stream from the propeller. Thus, placing the fin half above and half below the thrust line automatically produces the swept down fuselage profile, from the wing to the stabilizer.

Since we had had several out-of-control flights on the old machine due to a shifting tail giving too much control one way, and none the other way, Good's use of a separate fin built integral with the fuselage is now a must. While talking of tail surfaces, there seemed no better way of mounting the stabilizer than with rubber, in a recess in the bottom of the fuselage, where it would knock loose in a crash, or could be removed to reach the escapement which should be permanently mounted within the fuselage.

The wing location should not be excessively high if a high thrust line was to be adhered to. For quick fly-off in a crack-up it was decided to attach the wing as it is usually fastened on a pylon mounting, by means of two dowels, one in front and one in back of the wing. Side pegs protruding through a cabin have wrecked as many ships as they have saved (some of ours among them). The cabin itself is determined by the size of the receiver, plus batteries, allowing adequate clearance for all.

The present landing gear, while only a monostrut, works like a charm on a 60-ounce machine. Originally, double 1/8" wires had been led down to the axle position (wire-bound and soldered together), with one wire continuing around a curve toward the rear of the fuselage, then breaking out at a right angle to take the wheel. This gear should have been placed at least 2" further forward to permit the shock absorbing shape of the gear to function without nose overs. The gear on the plan appears to give just as much shock absorbing action without nose-overs and is adequately strong and simple. Double strut gears fold the rear strut on every hard impact, unless the struts are on the short side. On Frank Ehling's suggestion we tried *Davis* semi-pneumatic air wheels and have had fine results, even after a barbed wire fence punctured one tire. These wheels are a good compromise between light weight and sturdiness.

The wing features the same washed-out tips used by Good in the *Rudderbug*. Such tips prevent falling off on a wing and tend to permit the airplane to pull its tail up from a stall in power flight without sliding off. Their action is to delay tip stalls—just the opposite to polyhedral free flights design. Since they do depart from the desired airfoil section of the main part of the wing, and toward the symmetrical side at that, they certainly add to flying speed and possibly lower the L/D of the airplane. However, the only alternate is the use of tip slots which have proved out excellently on Foxworthy's airplanes. A Gottingen 549 airfoil is used on the *Citizen* because of success with the same section on earlier airplanes. It has beautiful stall characteristics and seems to give excellent performance at slow flight speeds. It is deep (about 13%), making easy the placement of deep spars through the ribs which, in turn, puts the nylon covering to work in absorbing both down and up stresses. The heavy sheet trailing edge which fits flush with the top surface of the wing is a la the *'Bug* and is traceable to a *Berkeley* kit. The false ribs proved superior to sheeting of the edges in taking collisions with sharp narrow objects.

The fuselage is of fairly unique design for a radio model, in that fairly soft and thin sheet balsa is relied upon for sides. This sheet is not full depth, and leaves a built-up superstructure behind the wing. The bottom is sheet-covered cross grain to the long dimension of the fuselage. A large soft block is used as a belly fairing; this block, together with the top cabin members, carries all the cabin loads. No primary construction exists on the sides between the front of the cabin and the rear, beneath the trailing edge. Rectangular sheet formers, grain across the ship, are used between the sheet sides from the rear of the cabin on back. The nose consists of four blocks, top, sides, and bottom, carved to shape after assembly, and then faced with a 3/16" ply firewall. The engine mounts externally with two bolts and is instantly and fully accessible. Downthrust and offset adjustments are easy to make.

The condenser is mounted on the engine for easy replacement when necessary. A medium sized wedge tank, thin edge down, and slightly tipped toward the rear, provides up to 7 min. of running time on the

(*Turn to page 40*)

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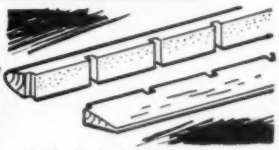
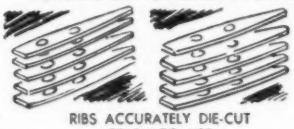


LEADING AND TRAILING EDGES SHAPED AND NOTCHED FOR RIBS

LANDING GEAR, READY FORMED SPRING STEEL



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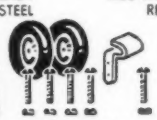

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11-6 Pow-OR *Props* recommended for this airplane. Other props will work as well, of course, but adjustments and setting may prove slightly different. Flight adjustments on any airplane can be discussed only with one make as well as one size propeller. Whatever make prop you start with, stick with it.

Perhaps something should be said about the durability of the construction described. It is estimated that at least a dozen flights were hung up in trees or bushes. Several of these accidents were severe, with the ship in level flight under power and the trees large and bare of leaves. In one case a tree on a mountain side had to be chopped down with the plane still in the topmost branches. Several other times the wings and tail detached with the plane falling to the ground. On one flight the ship got out of radio range quickly due to low A batteries and glided through three turns of a tight spiral into the woods with full left rudder. (An Aerotrol self-neutralizing escapement is now being tried!) During its early tests it spun in one full turn under power with rudder jammed left. This particular crash threw mud from the pasture, and the wing was tumbled several feet in the air when it detached. The engine dug a shallow "trench" about 1-1/2' long. This particular crash bent the landing gear back along the fuselage on the one side, but no damage beyond broken props (once a crushed but not broken leading edge) and occasionally punctured covering was suffered in any crash.

On one occasion the motor stopped about 30' up, in a steep climb into the wind after a bad launch, and the ship simply fell out of the sky, finally diving into the ground so hard that it bounced into the air and fell on its back; no damage except to the prop. On another flight, with too much rudder action, the ship was banked very close to the ground to avoid a bush and, turning before the wind, dived in before recovery could be made. This time the stab was tied on too tight and opened cracks in the rear of the fuselage. Much of this remarkable durability is due to the less than 5-foot size of the machine but a large measure of credit must go to the sheet construction. Another helpful item follows a valuable tip from Jim Walker (who, when he crashes, hits harder than anyone in the business! This is the use of light plywood reinforcement at the crucial cabin corner joints. In the *Citizen*, one piece of ply runs across the front of the cabin by the windshield, and another similar piece across the back of the cabin. The wind hold-on dowels extend through holes in these plywood pieces. Further ply gussets back up the joints of fore-and-aft cabin members at the top of the cabin. By using four heavy uprights of the hardest balsa at the cabin corners, and filling in the cabin roof with 1/4" thick sheet, the entire cabin (remember the belly block) is a box of great strength. The nose is virtually unbreakable since there is nothing to break. The remaining construction is designed with lightness as well as strength in mind.

Complete details on construction will not be given. First, essential information is shown on the plans. Secondly, a large amount of material remains to be presented in the second installment, concerning the radio, adjustment, flight testing procedures, and the kind of thing they never tell us R. C. dubs about.

We should like to add our observations on nylon covering. It is *wonderful!* Light weight nylon was obtained from *Jasco*, and Frank Ehling has briefed us on the art of applying it successfully. It definitely is not hard to cover with. First, all wood members to which it was to be applied were given a coat of dope to fill the pores. Then, after this coating dried, the nylon was applied wet, exactly like silk. A half-and-half mixture of dope and cement was used for attaching. Simply pull out the wrinkles and when you like what you see, dope it down. If wrinkles appear anywhere you can always soften up the nearest edge with dope and again pull out the wrinkles. One interesting observation is that the material dries at a fabulous rate. By working at top speed it was unnecessary to re-wet any panels. If the material dries out before it is completely attached, it may be re-wet on the job. To trim neatly, run your dope brush along the material outside the frame. When this doped portion dries it will be stiff so that the razor blade cuts neatly without snags and pulls.

About six coats of good clear dope will fill the pores. While we have seen heavy nylon take on an opaque milky appearance when doped, this lightweight stuff was semi-transparent when the pores had been filled. Visitors slyly keep trying to blow through it, or see if cigar smoke would work through; it won't, and the covering is stronger than silk!

It would be nice to say that an airplane has no weak points; such is never the case. The *Citizen's* big headache proved to be rudder response. It is strange that everyone thinks one must be a radio expert, but that flying is like falling off a log—the opposite is more nearly true. Before it will perform successfully, every radio model must be trimmed, by means of offset and downthrust, to fly absolutely straight under power. Not only that but its glide must be straight. Circles in both directions, right or left, should be the same size. There is some tolerance here but don't mistake "evidences of control" (as Harry Geyer calls them) for control. A tight circle on one side and a wide open circle on the other, sooner or later will end in an out of control flight, probably the first time you get the ship up in a breeze. And—this may happen though a breath is not stirring on the ground. Fore and aft trim must be on the ball with no tendency to hang on the prop, for that can spell loss of control (you'll blame the radio, when the fault really is with flight adjustments), most likely in left climbing turns, growing tighter and steeper. But this much is fundamental. The real tough problem, the one you don't hear much about, is rudder area and rudder movement or, expressed as a result, "rudder power."

Every plane has a margin between its cruising and glide speeds and must be trimmed differently for each speed. On both a real ship and the model, differences in nose-up or nose-down tendencies are taken care of by trimming. In the big ship you crank a tab to keep the nose down; in the model, you adjust (by downthrust) for a certain power speed. This speed, naturally, can't be deviated from without excess climb or loss of altitude, as the case may be. In most big ships, rudder adjustment is made by holding more or less rudder and, brother, this is what licks us R. C. modelers.

Under power, less rudder action is needed than in the glide. If you use the ideal rudder action for power flight, glide turns are sluggish and slow, especially in a wind. If strong control is used in the glide, the rudder action under power can spin the airplane, rolling it over and down if rudder is held. Twin rudders to keep these controls out of the slipstream are some help but the biggest factor is holding down the power-on speed, thus minimizing the difference between glide and cruise speeds.

Proper flying of the *Citizen* compels use of no more throttle than will give climb adequate to move the plane up wind, or to get over obstacles near the launching spot. With the timer arm in the nine o'clock position and the needle valve open one turn on an 11-6 *Pow-OR Prop*, the *Citizen* will climb slightly. More thrust may be added by slight advances of the timer arm, after you have adjustments well under control and have decided that more power is vital.

Open the engine wide, and the ship will climb high and fast, taxing the mind to the utmost to maintain control without a completely disastrous power wind-in. At high flight speeds the rudder is capable of almost snap rolling the airplane. Don't worry, though, your plane will behave. These facts are given to show the impatient critics of the learn-by-doing radio boys what manner of problems face the experimenter. Rudder movement that will flip a ship over at high speed, is the same movement that is needed to give a minimum of steering during the glide. At higher speeds, one

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must neutralize controls the instant a turn is begun, and must end a diving turn before it builds up, for the recovery is a zoom into a stall or loop. At reasonable speeds the ship sails around and you have no worries. If a wide range *must* be had between glide and power-on cruise, then some automatic device (such as a vane in the windstream) must be used to reduce rudder action under power, or to increase it when gliding. The wise pilot takes it easy at first. Later, if more power is used, the response of the ship can be stepped up for more spectacular flying. The *Citizen* has the combined virtues of both a primary and an advanced trainer. Outside of Walker, however, no one today is maneuvering at high flight speeds.

Don't ask us about more than one control, or proportional control. The latter proved too much for Walker who flies three *Fireballs* at once. He states he couldn't manage the ship when it got more than a few hundred feet from him. After one year, embracing more than 100 flights on two airplanes, the writer still makes too many mistakes on rudder alone! Eventually, he'll get to the *Rudevator*, the logical step ahead, which gives elevator and rudder action on a single channel.

For the beginner, an .09 glow version of the *Citizen* could do no wrong. And don't be tempted to open up the .199! Full directions on the complete flight testing procedure will be given next month.

PHOTO CREDITS

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32	*All*	**Robert C. Hare**

Championship O-49

(*Continued from page* 11)

The landing gear is constructed from 1/16" piano wire. Bend the ends of the #3 wire after brass tubing has been placed over it, as shown on plan sheet 2. Also bend in approximately 1/4" from scale on plan, to give the necessary spring tension or shock absorbing action. Hinges are made from light tin. Cement 1/8" sheet on both sides of wire and trim to a streamlined shape after drying.

The tail wheel is a 7/8" diameter sponge rubber unit with full swivel. Trexler #5 air-filled tires are used for the main gear, with the outer side of the hub countersunk so the washer can be soldered flush. Then make hub plates from 1/16" plywood and cement on both sides of wheel. This makes the tire thinner and closer to scale.

The cowl is turned on a lathe from solid balsa and the deflector is cut from 1/8" sheet. Use talcum powder and dope for a filler to help give that plastic-like finish.

For the engine crank case, a Jap celluloid engine was used, with heads and push rods built up from balsa, then sprayed with dull black lacquer. Scoops are carved from soft balsa along with the exhaust stack.

The wing construction is of the multi-spar type. Lay the tip out and raise 3/8" of an inch at tip after dry. Make a template from the front view to get the correct angle at the root rib. After multi-spars are cemented in place, fit in strut hook braces and wing hook pegs as shown on plan. The wing is held on with two small bands which afford enough "give" to release the dress snaps, should the model hit some object. Struts are made from hard stock and held together at the fuselage with one light band running through, the same as the wing. The jury struts are cemented to the main struts and ride free in the wing guides.

Lay out the stabilizer outline and place 1/16" strips for bottom of the ribs. Next, cement in the spars which taper at the tips to 1/16 of an inch. Finish with 1/16" square for the top of the ribs. The rudder is movable and is held in place with two pieces of soft wire.

A high-pitched prop is used due to the small diameter allowable on this 260 square inch ship. The prop is free wheeling because it is rather tricky to make a prop fold on a ring-cowled airplane.

The entire model is covered with Jap tissue. Light blue paper is used on the fuselage and fins and yellow on the wings and stab. To cover the fillet on the fin, spray tissue lightly with water and use heavy dope to tack it down so it will not set up too fast to be worked. After model is completely covered apply two coats of light dope. Strips of black tissue about 1/16" wide are tacked on for ailerons, flaps, slats, and doors. Also use black tissue for *U. S. Army* on under side of wings. Finish doping model with five more coats using caster oil in the last two coats. If you are lucky, you may be able to obtain 3-1/2" old-type star decals; otherwise they will have to be masked and sprayed as they were on the original model. This also applies for the rudder markings.

Now all that remains is to finish the greenhouse. Medium weight celluloid is used and is put on in sections, by fit and try method. Dope on strips of black tissue to clean up the seams. The cowl and wheel hubs are sprayed with red lacquer, representing an instrument ship.

Power for the model is 20 strands of 1/4" T-56 Brown Contest rubber; make up 10 loops 56" long, then put in 30 turns on a 4-1/2 to 1 winder, hold both ends together and fold. Release the folded end and motor will automatically braid itself and take up the slack. This method was used due to the model using free wheeling with no tensioner.

After the motor is installed and held in place at the tail point by 3/16" dowel, the model should balance just ahead of the 50% point of the wing. The model should weigh 8 oz. for contest rules. The winner weighed 14 oz. due to the heavy timber used throughout. Don't let this bother you because it doesn't seem to hurt any flying characteristics. The glide is just as flat as they come.

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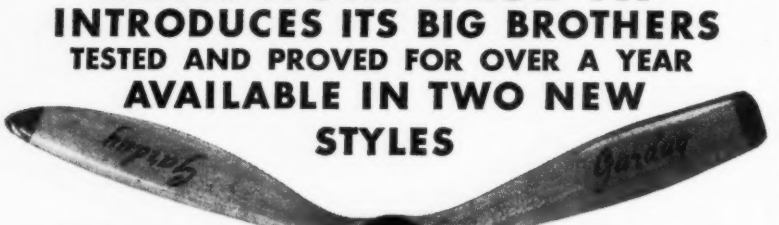

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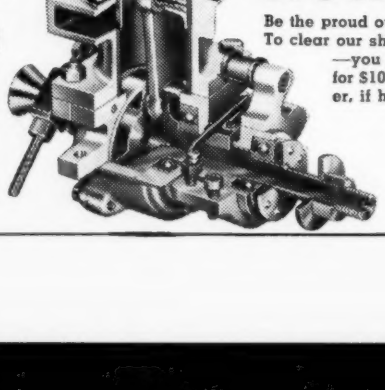

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Design Forum

(*Continued from page* 15)

under or forward surfaces of the blades during the descent of the model are the convex faces. In this case the concave faces are the "upper" surfaces. Nevertheless lift is generated through the free-wheeling action in spite of the inverted blade airfoil.

Now if you are an adherent of this free-wheeling principle, the results obtained depend upon *how it is used*. Free-wheeling action may serve no purpose and may not decrease the sinking velocity if not applied properly. In fact in one known case a free-wheeling propeller was used where the thrust line was high and the center of gravity low as in Fig. 3. Under these conditions the model flew beautifully under power but stalled repeatedly during the glide because of the backward force exerted high above the center of gravity by the free-wheeling action. The pull of the weight at the center of gravity and the backward force of the propeller created a clockwise moment C_1 which nosed up the airplane sharply into a stall. Under the action of this force couple, the angle of attack of the tail obviously increased, which produced greater lift on the stabilizer, thereby causing a counter-clockwise moment C_2. This latter moment in the case mentioned was not large enough to overcome or balance the clockwise moment C_1 of the propeller. Either the tail moment, C_2, was too small or the propeller moment was too large. It becomes apparent now that if these two moments are regulated so that the tail moment completely and satisfactorily balances the propeller moment while the airplane is gliding, the plane will continue on its normal glide and descent with the spinning propeller exerting an upward lifting and supporting force. It is possible that the best arrangement would be a set of conditions where the airplane assumes a gliding angle of 7 or 8 degrees under the action of the propeller and stabilizer moments.

The problem now is to balance these force couples properly so as to obtain the auxiliary maximum lift from both the stabilizer and free-wheeling propeller. This may be done by locating the center of gravity at a particular point relative to the thrust line or center line of the propeller shaft. It is obvious that the lower the center of gravity is relative to the propeller axis, the larger the nosing up moment will be. If it is approximately on the propeller axis as in Fig. 4, the force couple will be comparatively small or even zero. When the angle of descent relative to the propeller axis is 7 degrees, the backward force R will act at approximately 7 degrees as shown. The nosing up effect depends upon the distance M_P, between the force R and the center of gravity C.G. When the center of gravity is low (below the thrust line) this distance M_P, will be large and the nosing up effect will be large, Fig. 3. We suggest when starting your experiments that you design your airplane so that the center of gravity will be approximately on the thrust line, Fig. 4. This appears to be the location of the center of gravity in the winning European Wakefield contest planes. Tests with the center of gravity in different positions will give you the best arrangement for balance during gliding flight.

The center of gravity position may be changed by using a movable weight attached to your model. This weight should be used during all experiments so that the weight of the airplane will always be the same. Placing it in different positions, low or high, will change the position of the center of gravity, the location of which may be tested by balancing the plane on the end of your finger when it is supported with the wing in a vertical position.

Some model builders, believe it or not, do not advocate the use of either one of these prop types but contend that a fixed propeller does not reduce the flight time. They believe its drag actually reduces the sinking speed in a manner similar to the free-wheeling propeller. In certain airplanes this may be possible but often it destroys the smooth airflow over the wing and reduces its lift because of the resulting

turbulence. This does not occur to the same extent with free-wheeling propellers.

However, we do not pretend here to state which is best because there are so many flying conditions under which any of these three types may be used. No matter which method we might advocate someone would be sure to disagree. So the use of anyone of these types depends upon the experience and opinion of the individual model flier. But any fan's opinion at the moment should not deter him from further experiments and from trying various combinations of these types in order to bring out the advantages of anyone. Some may say that the English and Finnish boys won the Wakefield competitions *in spite* of the free-wheeling propeller. If this is true, then their planes, exclusive of propellers, were that much more superior to the American planes. This we doubt and feel that it is logical that free-wheeling propellers contributed to their flight advantages to some extent. In the old days where these propellers were used extensively in America, wonderful flight times were made, times that compared with modern records, so they must have some virtue.

Mr. Ray Musick of Gaston St., Dallas, Texas, apparently is out to capture some radio control prizes because he brings to issue the vital point in such contests, and that is *maneuverability*. Winning planes are judged largely on a basis of the maneuvers which they execute. So in designing such planes, we not only have the problem of making them efficient and stable in normal flight but they must also be maneuverable, readily responding to the controls. Many of these planes in the past have been so stable, because of the necessity of keeping the planes intact without crashes, that it has been impossible to maneuver them easily. In fact, such planes have resisted any maneuvers imposed by the controls. We believe that in most cases this has been due to the practice of placing the line of thrust and center of gravity too low and incorporating other features which would resist any displacement from normal flight course. It becomes obvious that if you are to have a maneuverable plane the only factors that must resist displacement are the factors that are controlling the airplane, namely the fin and stabilizer or the controls on these surfaces. This means that the best type of airplane to use is a plane in which all the centers of force reaction, weights, and areas are approximately coincident, when control surfaces are set neutral. If the rudder is turned in order to make the plane circle or spin, the center of lateral area should then move forward to a point above he center of gravity so as to create a sharp banking or lateral rolling couple while the tail is swinging sidewise and rotating about the vertical axis. If the C.L.A. moves forward to a point which is well above the center of gravity, the plane will have a combination of lateral and directional rotation and therefore a sharp spinning tendency. This may be produced by the use of a pylon that provides forward side area above the center of gravity, and a low fin that provides a low C.L.A. in spite of the high side area forward, when controls are neutral.

The spinning tendency is also enhanced by the action of a rudder below the stabilizer and longitudinal axis of the airplane when such maneuvers are desired, Fig. 5. Then the action of the rudder will not only push the tail sideways but will help to rotate the plane about the longitudinal axis more sharply into a bank and possibly a spin. On the other hand, if the plane is in a spin the counter action of the low rudder turned in the other direction will tend to rotate the plane *out* of the spin. There is a distinct advantage, however, during high speed flight in having the C.L.A. on a line with and close behind the center of gravity, because the high speed increases the displacing reaction tremendously.

In high-powered radio control models such as Mr. Musick wishes tc create, it is well for stability during normal flight and for safety, to keep all of the centers fairly close together. So we suggest a low wing airplane with 10 to 12 degrees of dihedral on each wing, similar to the one in Fig. 3,

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DICK CULVER, Oak Ridge, Tenn., son of the 1929 National Indoor Champ, Joe Culver, proved his own championship qualities by winning first in CO2 Junior with a Power Prop.

In "C" Free Flight Jr. **JIMMY JORSKI** of Oklahoma City won first with a Top Flite.

FRED WHITING, Oklahoma City, last year's second place winner, came through this year in first place in "B" Jr.-Sr. Payload using a Top Flite.

Top Flites came through again when **SONNY MURPHY** of Anderson, Ind., won "B" Free Flight Jr.

In Precision Stunt Open, **BOB DAILEY**, of Ferndale, Mich., took first with a Top Flite.

The Precision Stunt Junior Championship was won by **JAMES FRESHMAN** of Berkeley, Calif., with a Top Flite.

BILL BURGESS of Muncie, Ind., last year's "C" Free Flight Champ, repeated this year with a Top Flite in winning "A" Free Flight Senior.

And last year's National Junior all 'round champion, **CHARLES SOTICH** of Chicago, Illinois, used a Power Prop to win this year's CO2 Senior.

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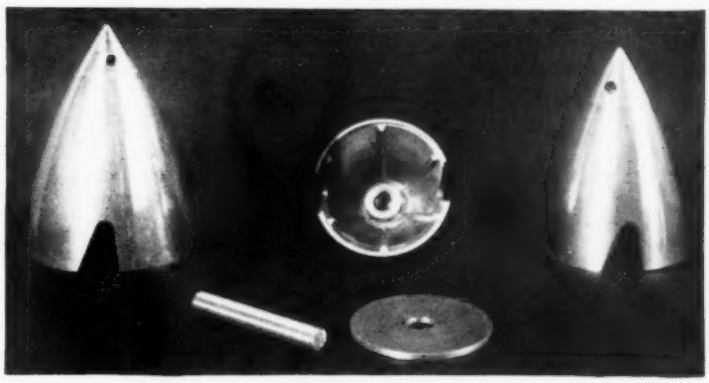

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but gas powered. In full scale airplane practice these planes are most maneuverable and yet when designed properly, are stable. This results from the center of weight, resistance, side area and lift being nearly coincident. They are also fast, usually the wings of such planes are set at approximately zero to one degree positive with the stabilizer at an angle which is 2 to 2½ degrees more negative than the wing. We suggest also that the rudder control surface be located below the longitudinal axis of the airplane. This will provide sharper banks and make it easier to spin the airplane. Testing this plane will indicate its general characteristics. Turn-and and spinning tendencies may possibly be increased by adding a vertical fin to the top of the fuselage above the center of gravity if this need is indicated. We will be most interested in hearing the results of Mr. Musick's experiments with his new radio control planes.

A picture of an excellent radio control plane design is shown on Page 429 of the writers' book MODEL AIRPLANE DESIGN AND THEORY OF FLIGHT. This plane was a Grant design and was built by Mr. Peterson of Detroit, Mich.; a similar one is shown in Fig. 5 herewith. It flew without wavering a fraction of a degree either in roll or yaw when flown in a 30-mile wind at a national contest. Wind or external factors seemed to have no effect upon it even though it traveled at high speed. In this type the rudder may be placed low in order to get sharp turns and rolls when needed. However when the rudder is in neutral the design is perfect for complete stability, even though it is of the pylon type, because the C.L.A. is low, on a line with the center of weight of the airplane, C.G.

Mr. Leo Northrup of Shawano, Wis., is interested in canard airplanes and appears to be in doubt about the proper distance between the forward and rear wings. The farther apart the wings are, the less critical the airplane will be. If they are too close together, the maneuvers will be sharp and sudden and care must be used in setting the two wings at their correct relative angles. The differences in angle between the wings must be small if the distance between the wings is short. This distance should never be less than 3 times the chord of the large wing. Usually 4 to 4½ times the chord gives best results. If the moment arm is too large, recovery reactions will be slower and may in some cases be too slow to avert crashes.

Send questions and ideas to *"Design Forum,"* MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York 17, N.Y.

Fouga Cyclone Model

(*Continued from page 25*)

as a block of wood, which will raise it a few inches above the work bench. Place it close to an electric hot plate, or another source of heat. Wear a pair of leather gloves to protect your hands from the heat, and prepare for a hot few minutes.

Take piece of acetate sheet, 5 inches square and about 0.02" thick. Gripping it by two edges, hold it close to the fire until it goes limp, then, very quickly, place it over the shape and pull down at the sides. Repeat this operation until the moulded sheet fits right down over the shape. The concave curves, where the domed portion blends into the fuselage lines, are obtained by pressing in with a stick of balsa while the acetate is soft.

Here are a few points to observe. The acetate remains pliable for only two or three seconds after it is moved from the fire. If the moulding turns whitish in places, it has not been hot enough. If it blisters, it has been too hot. Be prepared for some failures at first: it took us three attempts to get a satisfactory canopy.

Cowling. The cowling had to be a thin but tough shell. Also it had to be not readily inflammable, because the *Jetex* fuse flares up on being lit. We therefore reviewed the possible materials, and decided upon laminated paper.

Carve a block of balsa to the shape of the cowling and the short pylon which supports it. Sand smooth, and give one coat of dope to lay the hairs. Now rub with wax until a good wax skin is formed all over.

Cut, from bamboo paper or similar stock, a quantity of strips 3/8" x 3". Prepare some thin casein glue. (Thick glue makes the resulting shell too brittle.) Take each strip in turn, pass it through the glue, then apply it to the waxed form. Allow the strips to overlap, and continue until there is a minimum of three layers of paper all over. Where there is abrupt double curvature, gash the edges of the strips with scissors and they will mould to shape without wrinkling.

After 24 hours for drying, trim the edges, then cut around the middle where indicated on the drawing. Gently pry the two portions off the form.

Cement the front portion in position on the fuselage, and around its rear edge build up a little flange, 1/8" wide, from scraps of 1/32" sheet. The rear portion is removable to give access to the *Jetex*, and is held on by a pin pushed in from each side.

Wing and Tail. The wing employs a "curved plate" airfoil section which, the aerodynamicists tell us, is the best possible type for small models.

Cut the two wing panels from straight grained medium 1/16" sheet. Round off the leading edge, and sand the trailing edge to a taper. Brush a coat of fairly thick clear dope on the underside of the wing over the area indicated on the drawing. At the same time, moisten the upper surface with water. The combination of shrinking on the under surface and stretching on the upper causes the wing to assume the desired camber.

Sand the roots to the correct bevel, and join the two half wings; cement this joint well. Slide the complete wing through the slot in the fuselage until it takes up a central position. The cutouts at the wing joint allow it to fit over formers F2 and F3. Apply cement liberally all round the wing-fuselage junctions.

The tail is simply a smaller version of the wing, except that it has a flat uncambered section. Use 1/20" sheet of soft grade, and preferably quarter sawn for stiffness. When complete, slide the tail into its slot in the fuselage, and cement.

Doping. The amount of dope you can apply depends upon how light you have been able to make the structure. Bear in mind that the all-up weight of the model, complete with *Jetex*, should not exceed 1-1/2 oz., and dope accordingly. As a guide, our model complete but undoped weighed 1.05 oz., and we were able to dope as follows to give an all-up weight of 1.38 oz.

Fuselage ..Three coats of white.
Wing .....Upper surface, two coats of white. Lower surface, one coat of white.
Tail .....One coat of white.
Cowling ..Two coats of silver.

In addition, the fuselage has a black anti-glare panel, the wheel has a black tyre, and the tail has stripes of red and blue.

Flying. Wait for a calm day, then glide test the model very thoroughly. Adjust the fore-and-aft trim by means of the ballast. Directional trim is achieved by warping the wings and tail, as for a hand-launch glider. Persevere until a perfectly smooth and straight glide is obtained. We emphasize this point because the model flies very fast under power, and any slight out-of-trim forces become greatly amplified.

For the first powered flight use only half a pellet in the *Jetex*. If the model behaves well, you may safely employ a full pellet for subsequent flights.

The high thrust line tends to make the model dive under power, and therefore a certain amount of upthrust, relative to the fuselage datum line, is necessary. The drawing shows the *Jetex* built-in at the angle which we found produced a climbing angle of about 30°. If your model climbs too steeply, pack raise the rear edge of the *Jetex* mounting bracket. Packing under the front edge increase the angle of climb. It is interesting to note that the thrust angle on our model, which we found purely by trial and error, is exactly parallel to the thrust line of the *Turbomeca* engine on the full size *Cyclone*.

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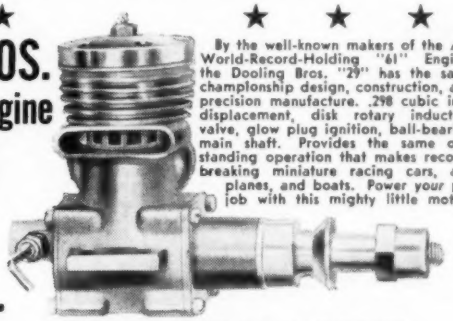

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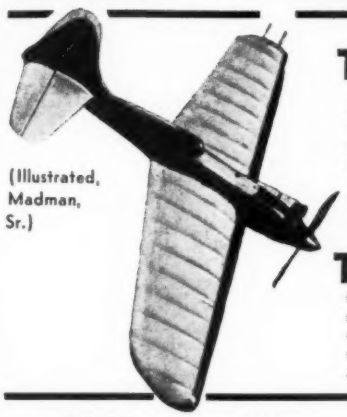

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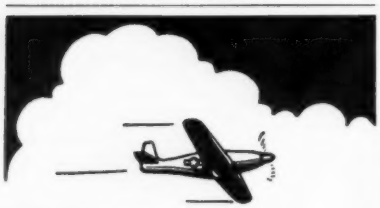
PRIZE WINNERS

Two more top place contest models will appear in the March, 1950, issue of M. A. N.! We shall include Don Donahue's highly successful Springfield Trophy Indoor winner. An added feature is Lew Mahieu's *Circulator*, a Class B speedster and holder of the Senior and Open AMA records.



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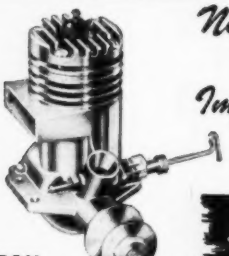

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Report from the West

(*Continued from page 8*)

taking 9 of 13 places in the Meet. The Sweepstake Trophy was won by Bud Chapman, the Beauty Trophy by Del Harbold, the Junior Trophy by Gerald Oldershaw, and the AA Trophy by Joe Stream. Winners were: *Class A*—Martin A. Martin 10:55; John Cassella 10:30; Keith Tucker 9:26. *Class B*—Gerald Oldershaw 10:32; Fred Bonar 9:30; Ken Oldershaw 8:10. *Class C*—Milton Ronney 19:20; Pat Reagan 17:16; Fred Bonar 15:40. *Class D*—Bud Chapman 19:00; Al Weymouth 13:55; Earl Ford 10:47.

Living in Seattle now, Carl Stokes writes that the boys in that area got together and were able to obtain the down town National Guard Armory for indoor flying. Hank Cole, Hubert Entrop, and other well-knowns and some beginners have been flying indoor on Saturdays. Carl and some of the other modelers there have already started on Wakefield jobs for 1950. Carl is building Chuck Wood's design—a picture of Chuck and his ship appeared in the December issue of MODEL AIRPLANE NEWS. Jim Amis also has a Wakefield under construction. Carl says about Jim's new ship, "He just loves multispars, and I think it will sport a million of them including the fuselage . . . strictly for looks."

Some West Coast speed fliers would like to see the use of oxygen in speed jobs prohibited because of the extreme danger. It is prohibited in all other types of racing for this reason. Maybe AMA has caught this?!?

We are hoping for more of that warm weather for Record Trials January 1 and 2 at Long Beach. We'll let you know the outcome in the next issue.

World War I

(*Continued from page 33*)

parts, superimposed, further shortening the tail moment arm by virtue of CP movement in the wings' narrow chord.

To this he added an unusually thick high-lift (and drag) airfoil section, balanced control surfaces throughout, and an additional wing attached to the landing gear spreader bar between the wheels. The wing, he theorized, although unusually thick-sectioned and drag-creating, would by virtue of its cantilever construction permit the elimination of all external bracing which also caused considerable resistance. He achieved, at least theoretically, a balance in favor of the thick wing in combat—its ability to withstand piercing by bullets without giving away.

Design of the Fokker Triplane began later in 1916, and the first ship was ready for testing in the spring of 1917. The prototype was amazingly like the production article, except it had unbalanced ailerons, and no interplane struts. It was Fokker's contention that such a tiny, close-coupled airplane would not require balanced controls for lateral movement. He also designed the cellule to be completely self-supporting in each of its elements. The airplane was a peculiar looking thing, very short, of small span, and very high—its three wings overhanging from the fuselage or center section, and no struts!

He presented the ship to authorities with a demonstration such as they had never witnessed before. He literally flew the ship inside out, to prove his Junkers-inspired theory of cantilever construction of wood and fabric. German air procurement representatives fully expected the wings to fall off, but they didn't.

The official verdict was that the Fokker Dr. I, in its prototype stage was an excellent plane, but a psychological barrier to the pilots of the Black Cross. Officialdom were of the opinion that a German pilot, in heat of battle, would not trust the cantilever construction of the wings, and therefore be afraid to wring the ship out. Official engineers further stated that since the cantilever principle was untried, it could not possibly have merit, and they refused to be the sponsors of something they could not understand.

Fokker was told, however, that if he

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—How to prevent spiral dives?
—What size propeller should be used? ETC. . . . ETC.

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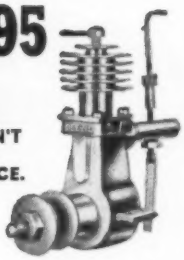

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strengthened the wings with struts, the Dr. I would be acceptable. He argued in vain, defending his mathematically proven theory, but finally had to recant. He would, he said, redesign the wings to include struts, and returned the ship to his factory at Schwerin.

(A rumor that the Fokker Triplane had been condemned by the German authorities sprang up at this point. This rumor also reached England, and the plane was written off by Allied Intelligence. When production models appeared in late 1917, the Allies were of the opinion that a greatly improved ship was at hand, yet it was difficult to understand why the triplane should have been resurrected.)

Fokker did not redesign the wings, however. He did two things: first, added balanced ailerons and, second, added struts. The joke to it was this—the struts were merely ties and not structural members. Although the interplane struts probably helped to distribute the load between the wings, the wing structure itself was not altered.

During the summer of 1917, the Fokker Dr. I finally was accepted, and production of planes and spares was begun. Operationally, the Fokker Dr. I was an interim airplane. It was inexpensive to build, very easy to fly, but beyond its extreme maneuverability and climb it had little to offer. Nevertheless, it acquitted itself well in combat along with the obsolescent Albatros D. III and D. V types and the Pfalz D. III, with which it was often teamed in squadrons. At this period (winter, 1917-1918) the Albatros and Pfalz were being retired as soon as the Fokker Dr. I. could be supplied; meanwhile other newer ships such as the Roland D. VI and Fokker D. VII were in test or development stages.

The Fokker Dr. I Triplane is so often recalled in connection with Manfred von Richthofen that it is somewhat of a surprise to consider that only 20 of his victories were obtained with it—the other 60 were obtained with other ships, particularly Albatros types. Equally interesting is the fact that the Fokker triplane's period of usefulness as a fighting machine lasted only over a period of seven months. During that time, the "Tripe" was supplied to squadrons until 150 examples of the ship had been built up to April, 1918, then production was stopped and efforts concentrated on the Fokker D. VII. As Dr. I's were replaced by newer types, they were transferred to lesser squadrons, shunted to training fields, and by November, 1918, only a handful remained intact, none of them in first line service.

During their seven-month heyday, however, several German pilots set up some remarkable scores with the Fokker Dr. I. Werner Voss, in particular, had a meteoric career 21 days long, in which he shot down 21 Allied planes. There were other similar performances by both German and Allied pilots flying other types of ships, and it was probably the airman's consummate skill rather than the plane that deserves credit for the accomplishment. Voss, like von Richthofen, were flying Fokker Dr. I's at their deaths, and their names will probably be permanently associated with the type in aviation's musty annals.

PERFORMANCE. Many particularly colorful or unusual World War I airplanes have been credited with performance figures that would have made even their designers blush. The Fokker Dr. I, for instance, has been credited with as high as 150 mph top speed. If that had been true, combined with its other true characteristics, the Germans probably would have built nothing but Fokker Triplanes from 1917 on.

The Dr. I was strictly a short-range plane, with fuel for just 1-1/2 hours' flight, and designed to operate only in its own front-yard. Its designer admits, in his memoirs, that it was unsually slow, compared to Allied types. At sea level its top speed was only 115 mph. The other German types with which it flew, had to throttle back at certain altitudes to prevent walking away from it. At 18,000', its ceiling (due to the fact that the Oberursel refused to run above that altitude), a good Fokker Triplane could do about 80 mph. In still air, it landed at 30 mph, and in a power-on landing, it could be stalled in at even less than that.

Climb of the Fokker Dr. I, however, was one of its major assets. It started upstairs at nearly 2,000 fpm and reached 3,300' in 1-3/4 min. Six thousand six hundred feet was reached in 3-3/4 min.; 9,900', in 6-1/2 min.; 13,200', in 10 min.; and 16,500', in 14 min.

It was feather-light on the controls at low altitudes, and responded exceptionally well to control at high levels by merely increasing control movement. Around 5,000', for instance, sudden and full use of ailerons at full speed would nearly black out a pilot. The ship could literally *turn on a dime* at any altitude, and it could dance like a butterfly in a high wind even in a power-off glide.

The Fokker Dr. I probably could be landed in a smaller area than any plane ever built, except a rotating wing type. Richthofen is supposed to have been forced down into an area 20 meters in length (about 65' of effective runway), when his propeller was damaged. The story goes that he took off again from this same space after his propeller had been replaced, by having a couple of ground crew members hold the tail of his plane and letting go after he had revved up the engine to full power.

In any event, the Dr. I could get off the ground normally after a 100-foot run, and stopped in a little less distance after touching down.

Without a doubt, the Fokker Dr. I was one of the most unusual planes produced during World War I. While not the best, by any means, even in its heyday, it was surrounded by a certain color of circumstances, and an oddness of appearance that set it apart from anything the Germans produced up to that time.

What made this little ship tick? An analysis of its structure will be presented in the March issue of MODEL AIRPLANE NEWS.

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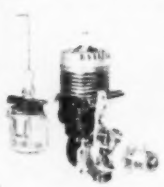

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Air Ways

(*Continued from page* 31)

Our fifth snapshot was sent to us by the Editor of AERO-REVUE SUISSE (Post Office Box 18, Geneva I, Switzerland), Rico Neidhart. The individual appearing in the snapshot is Alex Patrucco who won the "Second Geneva Cup" and we presume that the model he is holding is the winning ship. This airplane is equipped with a *Movo* 2 cc. engine which apparently is mounted in an inverted position.

James G. Schenck (614 Ridgefield Avenue, Pittsburgh 16, Pennsylvania) who is extremely active in the Pittsburgh area and particularly at Hillman's Model Wings Airport, sent us picture No. 6 which shows a Piper PA-11 scale model equipped with radio control. This large ship has a span of 81" and Mr. Schenck notes that most modelers' eyes pop out when he tells them it weighs fully 10 lbs. However, he has found this weight to be quite an advantage when flying in breezy weather or on hot days with lots of thermals. This very attractive scale model is powered by a *Viking Twin* engine which turns a 13" propeller at 6,000 rpm, and has been found ideal for the purpose. A recent addition was an escapement operated by a thermal delay arrangement which enables Mr. Schenck to obtain three different engine speeds. The ship is fitted with the Good Brothers radio equipment and has been found capable of tight left or right circles without any spins or dives.

Photograph No. 7 is the work of Mr. R. Galbreath, a member of the *Blackheath Model Flying Club* and was sent to us by Brian Fairey (110 Widney Road, Bentley Heath, Knowle, Birmingham, England). Mr. Fairey gave us no further details but does request that we feature as much material as possible on radio control in future issues of MODEL AIRPLANE NEWS.

Two ambitious scale modelers are seen in picture No. 8, which was forwarded to us by Charles H. Thomas, president of the *Albatross Model Airplane Club*, (2443 Trent Street, Victoria, British Columbia). He tells us that the Stinson on the left was built by Bud George and is powered with an *Ohlsson 60* while the Douglas A-26 *Invader* on the right was built by Mike Murray and is powered by two *Contestors*. We presume these are the gentlemen shown with the respective planes, which incidentally are both controline. This picture was taken at the City Championships, promoted by the *Victoria Model Airplane League*.

Another free flight model appears in No. 9 and is the work of David K. Foxcroft (167 Hanna Road, Leaside, Ontario, Canada) whose wife is proudly displaying the ship. It has a 300 sq. in. wing area and powered by an *Ohlsson 19*, and has been found to have a very fast climb and also a fast glide. Standard ignition is used in this case.

The tenth photograph reached us by a very roundabout route. Bud Kosby (227 Seale Avenue, Palo Alto, California) forwarded the photo to us and writes that it was taken October, 1948, in Tokyo, Japan, by Lt. Col. Henry Godman, General MacArthur's personal pilot during the war. The plane of course is the B-29 . . . and it was built by an unkown GI. Power is supplied by four .60 engines, which are Jap copies of Ohlsson's. The Colonel mentioned that the engines run well but are not very powerful. The airplane is equipped with workable landing lights and also has a working retractable gear that comes down for landing when the engines are cut. Incidentally, Col. Godman has been an enthusiastic model builder since 1934 and is still active in all phases of the sport.

No. 11 undoubtedly does not do full justice to the outstanding workmanship on the Supermarine S.6.B. by Ian W. Moore (Two Bridge Street, Derby, England). This ship was built to a scale of ½" to 1'. It is of course a solid model and carries a fully detailed cockpit. The airplane was good enough to win second place in the S. M. A. E. National solids contest in 1943.

Another high-class nonflying scale model appears in our last photograph which was sent to us by Anton Huber (Heimatweg 6, Lucerne, Switzerland). Mr. Huber who is an invalid and unable to get around gets a tremendous thrill out of doing these scale ships and has built a number of them. He writes us that this ship is a Swiss military type; the model has a 25" span and has all workable parts, such as guns, cockpit controls, and the like.

A note has been received from Dr. J. N. Simmons, builder of the unusual pusher canard model on page 33 of our December, 1949, issue. Dr. Simmons wants it known that the wingspan of this highly successful model is only 16" and *not* 60" as quoted in our text. Modelers wishing more information on this airplane may obtain same by writing the builder at his new address, 4828 Whittier Boulevard, Los Angeles 22, California.

NEWS OF MODELERS

PEN-PAL SEEKERS: F. J. Sturley, Dudley Private Hotel, Bagot Road, St. Helier, Jersey, Channel Islands, England, is chiefly interested in scale models and would like to exchange kits as well . . . 3122832 Cadet Pilot Beach, No. 40 Pilots Course, No. 1, I. T. S., R. A. F. Wittering, North Peterborough, Northants, England, seeks an American correspondent and is willing to swap English and Continental diesels . . . 2396258 Ac Bird, Electrical Section, S. A. S. S., Royal Air Force, Tengah, Singapore, China, is mainly interested in free flight power and stunt and speed controline as well as large gliders.

EXCHANGE MOTORS: John J. Dudenkoffer, 75 Ocean Avenue, Brooklyn 25, New York, has several Arden .099 plain bearing engines which he would like to sell or trade. They were given to him as a gift and as he is a model railroad builder, he has no real use for them.

CLUB NEWS

Alabama

The *Dope Daubers*, of Selma, have continued to progress since they were organized a year ago and wish to extend their thanks to the Exchange Club of Selma which has been lending a helping hand in every way for the past year. The *Dope Daubers* can boast of a complete workshop only because of the efforts made by the Exchange Club who financed the workshop. Most every type of modeling is enjoyed by the members.

California

Radio control is continuing to gain more and more interest. The *Mustangs*, of San

Francisco, are going in for R. C. flying in a b-i-g way. Three of their members have obtained Rockwood three-channel control units. Quite a few of the other members have been attending every Saturday's practice and test flights at Pleasant Hill (near Walnut Creek, home of Rockood Radio Controls).

We learned the following from the publication WEST COAST MODEL NEWS. The "Robbers," of Oakland, besides doing all the hard work of recording meets, acting as judges, club advisors, AMA leaders, W. A. M. recorders, model builders, record holders, timers, etc., etc., which they comment is all for FUN (?), both hold down regular jobs. Mom is a Doctor's receptionist and Pop is a wheel at the Caterpillar Tractor plant.

Minnesota

We thought you would like to be reminded a couple of months early this year so that you could prepare for the forthcoming Talent Scout Model Airplane Contest, sanctioned by AMA, and sponsored by the Association of Twin Cities Hobby Retailers, Inc., plus jobbers, and manufacturers in the hobby industry. The meet is open to entrants, boy or girl, under 17 years of age, and will be held on May 21, 1950. Further information in detail is given in the *"Air Ways"* section elsewhere in this issue.

New York

The *Brooklyn Doodlers* are eagerly searching for new members in their vicinity. They have recently elected for president, Charles Cretella; corresponding secretary, Eugene Sohl; treasurer, John Semler; and publicity director and recording secretary, John Marotta. If you live near-by this area —Woodhaven, write the secretary at this street address, 751 Jamaica Avenue.

The *Dansville Aero Blazers* have been given a pasture of two acres for flying purposes. This land was donated by Frank McNair, a relative of one of the members. The property is being leased to the club for a fee of one dollar each year; the lease expires in 1955. Results of their first election of officers for the coming year are: Karlton E. Randall, president; John Shafer, vice president; Francis Henty, secretary and treasurer.

Francis Ptaszkiewicz, of the *Buffalo Flying Bisons*, writes that with the beginning of Armory indoor flying, the *Bisons* have initiated a new type of event for their flying sessions. This is a miniature Goodyear race for ships with engines from .000 to .075 cu. in. displacement. The idea was formulated and put into effect by the *"Flying Bison* Speed, Stunt, and Sport Teams." Over fourteen models were ready to be flown in the first official heat of the race, held on December eleventh. A few of the models have been flown at speeds up around the 90 mph mark.

The rules of this event are simple so as to encourage as many members as possible to construct a model for this event. They are as follows: 1. Engines shall not exceed .075 cu. in., shall in no way be reworked, and must be available for inspection at any time. 2. Model is not restricted to any scale except that it shall look like a feasible airplane, and have wing area no less than five times the engine displacement; this makes about 35 sq. in., the minimum wing area possible. 3. The airplane shall take off and land on a gear and shall have at least the engine crankcase cowled. 4. Line length shall be 25' 3" and the model must be timed for eight laps, time being started *upon release of the model*. Due to the simplicity of the rules, two die-hard free flighters have already come up with very promising racers.

With the ending of the 1949 contest season, we found that our "speed team" came up with a total of 85 first, second, and third places. In addition to this, we have two record holders, namely, Robert Rowe, who holds the Class A F.A.I. Circular Course Speed record with 99.37 mph; and Harold de Bolt, who holds the AMA Class A and D Open Speed records.

Ohio

The main event of the Akron *Model Wings'* meeting was the election of the new officers. Those elected were: Joe Laterza, president; Bill Goodrich, vice president; Marlin Haas, secretary; and Joe Mako, treasurer. The only change from last year's officers is that Danny Mamay is no longer secretary; he did an outstanding job for the club last year. New "T" shirts were issued. They have an emblem in gold of the air corps wings, around which are two circles in blue. Lettering in the circles reads: Naval Air Station, Model Wings, Akron, Ohio.

The *Rubber City Aeronauts* celebrated the first birthday of the club's monthly bulletin PROP WASH. The circulation has varied from 200 to 500 copies during the past year. Editor R. E. Baughman wishes to thank Ray Yoho, Nancey Yoho, Danny Mamay, Ruth Kemmerline, Ed Conrad, Barbara Yoho, Jim Woods, Johnny Ward, Frank Eblen, Nick Hauprich, Herb Baughman, Hubie Wise, Jay Stokes, Dick Fox, Dick Obarski, Bill Davis, and his wife, Nina Baughman, for the big help they gave in publishing the paper. Also he writes: "Many, many thanks are due the Firestone Air Scouts for letting the staff use their quarters as a publishing office." Thanks to Bill Burkhardt too, for furnishing an office for the paper for three months. Editor Baughman hopes the above people will continue to run PROP WASH during the coming year and will help celebrate the paper's second birthday.

Oregon

The *Fire Balls*, of Portland, are still enthusiastic over Jim Walker's Flight Plan U-control contest idea. One of these contests was tried in September, 1949, to check the details; a big trophy was donated by Jim and will be kept rotating at future such contests of this club, or by any club that agrees to fly under Flight Plan rules. A few changes were made in the rules, and on the score sheet, but the basic plan remains the same. Full details, including the type of form used to record results, may be

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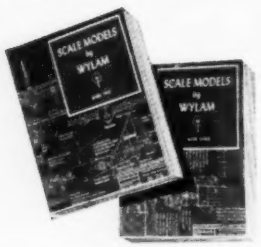

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obtained from Ray Arrigotti, of the Publicity Committee, *Portland Fire Balls.*

South Carolina

We have just received the results of the Third Annual Southeastern Model Plane Meet sponsored locally by *The Charleston Prop Busters* and the *Charleston Exchange*, held at Truluck's Airport. Harold Lentz, who was the contest director, did a wonderful job. Winners: *Class A Speed Open*—Jack Scharpf 91 mph; *Sr.*—Charlie Edwards 100 mph; *Class B Speed Open*—Bill Peck 100 mph; *Class C Speed Open*—Lloyd Underwood 113 mph; *Sr.*—Charlie Edwards 120 mph; *Class D Speed Open*—Gus Johnson 127 mph; *Sr.*—Charlie Edwards and Ed Robinson (tie) 122 mph; *Jet Speed*—Lloyd Underwood 118 mph; *Stunt Open*—Jack Scharpf 391 pts.; *Sr.*—Paul Nash 348 pts.; *Jr.*—Pa Acosta 294 pts.; *High Point Winner*—Lloyd Underwood. Our thanks to Don G. Kinne, secretary of *The Charleston Prop Busters*, who sent us this information.

South Africa

Secretary de Villiers joyfully announces that at long last Bloemfontein has a brand-new model airplane club—*Centre City Model Airplane Club*. Chairman S. van der Westhuizen and Secretary de Villiers were elected at the first meeting by twenty-two modelers.

Model Jet Engines

(*Continued from page* 29)

Model Turbojets. The turbojet far outpoints the pulse jet in design complexity. The engine consists of a shell or body inside of which are mounted two rotating units—a compressor and a turbine. The compressor is generally located just behind the intake or head end of the engine and is coupled to the turbine by a shaft. Between these two units is the combustion region where fuel is injected and burned. Operation is as follows: air entering the compressor is drawn through it and compressed. At a higher pressure, it then flows through the combustion region or into a combustion chamber where it mixes with fuel and the combination is ignited, generally by a spark plug. The energy released during combustion causes the gases to speed through the turbine and out a tailpipe at high velocities. The heat energy has been partially converted to kinetic energy or energy of motion by virtue of the high pressures of combustion. Part of this energy is expended in rotating the turbine which, in turn, drives the compressor. The process is known as a regenerative process since part of the energy of combustion is diverted back to the beginning of the cycle to work on the incoming air by compressing it.

The earliest experiments on model turbojets known to the author were carried out by G. W. Harris, of Barnsboro, England, in 1942. His turbo-jet design (illustrated) was constructed despite the belief amongst several of his associates that a miniature turbojet would be highly inefficient, if it ran at all. In the ensuing two years Mr. Harris worked on four engines during what time he could spare from war production work on the big jets. His Mk.11, the second turbojet, is illustrated. It is similar in design to most of the modern-day axial flow gas turbines, being composed of a single stage axial flow compressor driven by a two-stage turbine. A "stage" consists of a rotor (spinning) blade which is mounted on the turbine or compressor drum and a stator (stationary) blade. In determining the number of stages, count the number of rotor or stator blades in any axial row since each stage may have a number of blades or buckets around the perimeter of the drum. The large scale turbojets may contain as many as 29 stages in the compressor alone. The hot gases expanding in the turbine react on the blades thereby furnishing work to drive the compressor.

In the diagram, the compressor at the head end of the engine consists of a spinner (A) to which are brazed seven compressor blades. The compressor does not have a row of stator blades and it is assumed that the inventor considered the single row of rotor blades as sufficient to compress the incoming air. The spinner is notched at its nose so that it may be coupled to an electric motor for starting purposes. Threaded into the rear of the spinner is a 5/16" diameter steel shaft (B) which connects at the outer end to the body (drum) of the turbine (C). The shaft is supported by two ball bearings (D) which are mounted in a bearing housing (E) consisting of a length of steel tubing. The housing (E) is centered in the jet engine shell (F) by four supports (G) which are brazed to it and the inner walls of the shell. The rear spinner, or bullet connected to the turbine drum (C) is used to permit a smooth flow through the exhaust venturi. In a large gas turbine, this bullet can be controlled by the pilot to regulate thrust by moving it in and out of the venturi.

Stator blades are welded around the inside perimeter of the shell between the stages of rotating blades as shown. Fuel is injected into the combustion chamber through two small venturi inlets (H) and ignited by a spark plug at (I). In tests run by Mr. Harris, two types of fuel injection were tried, one by pressurizing the fuel tank with a few pounds of air and the other by gravity feed with a float valve control.

As for the performance of this engine, the author can only quote from an article in the December, 1944, issue of the British model magazine AEROMODELER in which Mr. Harris states that the first unit was destroyed shortly after the starting electric motor was uncoupled. The turbo-jet was turning at about 6,000 rpm with the fuel burning hotly in the combustion chamber. Whether the engine failed at the bearings or supports, or by melting of the blade brazing is not known. However, in designing such a unit, perfect balance and alignment of parts in addition to the use of correct materials which will not fail under the high temperatures in the combustion chamber and turbine are mandatory. In large turbine manufacture, the blades are secured to the turbine drum by machining them at the root and pressing them into a mating notch on the drum. Alignment is much easier and there is less danger of failure at a welded joint. Mr. Harris's work is deserving of the highest praise since his pioneer designs are most certainly the forerunners of the model turbo-jets which followed, and of those yet to be built by model experimenters throughout the world.

Mr. M. Dreher, of Zurich, Switzerland, is the designer and builder of a successful model turbojet, the *Ghost M.D. 35e*, (also illustrated) which measures 14-3/4" in length. The over-all characteristics are:

Maximum Speed	75,000 rpm
Total Weight	4.3 lbs.
Fuel	Benzine
Fuel Consumption	2.83 oz. per minute
Exhaust Temperature	740° C
Maximum Diameter	6.51 inches
Max. Thrust	5 lbs. plus

Good lubrication is attained in the *Ghost* turbo-jet by filling the space between the main shaft and its casing (see diagram) with oil. The compressor used is the centrifugal type and is backed by a single row of diffusing (stator) blades. Fuel is injected behind these through a number of nozzles around the perimeter of the engine. It flows through a multitude of tiny holes in the casing shown and enters the combustion chamber where it is ignited by a spark plug. The purpose of the holes is to distribute the flow of fuel and air more evenly and to increase turbulence.

While the larger turbo-jets are used quite universally for full scale jet propulsion, engines of this type have not been used to any great extent in the model field. This is due to the fact that it is the most complicaed of all the jet engines, requires the most precision and skill to make and, hence is the most expensive. It has advantages over the pulse jet in that it makes far less noise when running, and may be operated at lower temperatures. A properly designed model turbo-jet will produce considerably more thrust than any of the rockets or ram jets experimented with so far.

Part Two in the March 1950 issue will cover model ram jet and rockets.

French Fouga Cyclone

(*Continued from page* 21)

of 110 lbs. beside the two occupants, weighs only 1,157 lbs. fully loaded and can be towed to 150 mph.

And so it is that when we come to discuss the Fouga *Cyclone* it is clear that it represents the combined technical skill of an able and widely experienced team of designers. Known more accurately as the CM-8 R.13, we see that it is the latest Castel-Mauboussin design founded principally on their wide glider experience. The *Cyclone* is, essentially, a 43-foot span glider of single-seat design and incorporating a "butterfly" tail. But, more importantly, perched atop its fuselage just behind the pilot's canopy is a tiny but powerful turbo-jet engine!

The engine is the Turbomeca O11 turbo-jet that produces 176-lb. thrust at take-off and 180-200 lbs. maximum while weighing only 80-100 lbs. itself! The tiny engine is designed for simplicity. It is only 16" in diameter and only 32" long (remember, a yardstick is 36"!) yet incorporates a centrifugal compressor, an annular combustion chamber, a turbine, and a tailpipe! It's principal novel feature is a rotary fuel injector, which, instead of spraying the fuel mixture steadily into the combustion chamber as on other turbo-jets, sprays its mixture through a flanged wheel mounted on the compressor drive shaft. This imparts a rotary motion to the fuel spray and thus insures ample mixing and turbulence in the combustion chamber.

Secret of performance of the miniature turbo-jet engine is its terrific speed of 34,400 rpm. This high speed can be obtained, easily of course, in such a small size turbine since the rotating parts are small but it still places great demands on the quality of the materials used in its construction. The engine has withstood extensive test-stand running and has stood up well in all tests to date.

Like the airplane itself, this turbo-jet engine is no "fly-by-night" product. Turbomeca has had years of experience in the design and production of compressors and superchargers. This tiny engine, as a matter of fact, was one of the very early turbo-jet designs, having been designed long before the first historic Gloster fighter made its first test flight in May, 1941! Societe Turbomeca was formed in 1938 by M. Szydlowski and Planiol, the well-known supercharger designer; and just before the war the new company received a large contract for the production of a supercharger it had designed for the Hispano-Suiza engine intended for Dewoitine fighters then going into production. After the surrender of France, the company was moved from Billancourt to its present location at Bordes and, after the Armistice, it continued production of its superchargers with a total of about 1,500 being delivered.

During this period, M. Szydlowski designed the tiny jet engine but its construction was halted by the surrender. The company was seriously disrupted by the German occupation and it was not until after the liberation that it continued its development work on new projects. It is now in production on superchargers for Hispano-Suiza and Gnome-Rhone engines. M. Szydlowski now has under his direction a group of former German scientists who are completing the design of a turbo-jet engine with a thrust of more than 15,000 lbs.!

The Fouga *Cyclone* is a conventional high aspect-ratio glider design with a span of 42' 8" and a length of 20' 4". It has a wing area of 140 sq. ft. Because of its light weight and small size, it carries a fuel tank with a capacity of only 26 gallons for the turbo-jet engine. This small capacity, of course, severely restricts its range and it is credited with a range of only 150 miles. However, the ability of the craft to perform as a conventional glider means that the turbo-jet engine need not be operated all the time and the range, therefore, can be stretched to any desired amount depending upon the availability of thermals, etc.

Fouga claims that the *Cyclone* has an initial climb of 780 feet per minute, a ceiling of over 30,000' and a top speed of 160 miles per hour at 10,000'. When it is borne in mind that it has only the equivalent of 85 hp, this performance is seen to be quite good. As any engineer will gladly explain, the turbo-jet engine is inefficient at speeds below about 500 mph and the Turbomeca O11 has a specific fuel consumption of 1.4 lbs. of fuel per pound of thrust per hour at maximum thrust. A little calculation indicates that it, therefore, has fuel for only about ½-hour's running, so that there remains some question as to how it obtains its 150-mile range at a speed of 160 mph.

As stated previously, it is possible to extend the range of the airplane by intermittent running of the jet engine but this raises the serious problem of mid-air engine starting, which has been a difficult operation to perfect even with highly-developed turbo-jet engines. It appears that the Turbomeca O11 would be no exception in this regard since its high operating speed indicates, also, a high starting speed. The turbo-jet engine starting problem is simply one of windmilling the engine up to starting speed. In the case of jet fighters at high altitude, this can be done by a high-speed dive. In the case of the Fouga *Cyclone*, it would appear difficult to dive the airplane to a speed causing the engine to turn up to 10,000 rpm or so for starting.

There is no question but that as an experimental research airplane, M. Mauboussin has scored again with his brilliant, original design skill, in combining the turbo-jet engine with a high-performance glider. But the practicality of such a plane remains a dark question. For the thrill-seeking sportsman pilot, here may be the answer to his dream of becoming a "fire-can jockey" at only moderate cost. But for the average private pilot, who still finds much to criticise in existing conventional personal aircraft, this new experimental craft is certainly not the answer to his problem. But we'll bet that Fouga will do a brisk business with its prototype in giving trial flights to the hundreds of curious pilots who are flocking to its plant and flying field near Aire-sur-l'Adour!

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(*Continued from page* 14)

design. Planes must come within a maximum engine displacement of 190 cu. in., a minimum weight of 500 lbs., a maximum wing loading of 12 lbs. per square foot, and must use fixed landing gear and fixed pitch propellers. All entries must pass rigid inspection and acceptance tests before a technical committee of engineering experts. Sounds like something the AMA might have cooked up, doesn't it?

The race itself is flown around a tight 1-3/4-mile oval course, the two turns each being marked by three pylons. It consists of a series of elimination heats leading up to a final 12-lap race for the ten fastest planes and an eight lap consolation race for ten of the slowest. Every participant is assured of some prize money with $7,320 possible for the high man.

So exacting has this race become that new designs seldom reach the top in their first year of competition. Rather, the ships that have been revamped and improved bit by bit, as new lessons are learned each year, are the ones that maintain the winning positions. The Wittman and LeVier ships are excellent examples of that type of development.

Even among the lower placing racers the same tendency is noticeable. A good case in point is Al Foss' *Ginny*. Last year as a brand-new plane it placed seventh in the consolation race, right down there at the bottom of the list with a 125.2-mile speed. Yet, in this recent race Al won a semi-final heat at 165.116 and thus reached the big race. The *Foss Special* is an all metal job and a real beauty, having a high aspect ratio wing and an unusual high stabilizer.

Keith Sorensen's *Deerfly* was the exception to the aforementioned rule. An extremely neat airplane, it took the second prize in its first appearance at the races.

Quality of workmanship on Goodyear planes is of all grades. Invariably, however, all of the ships reaching the finals are perfection itself. Naturally, construction methods and materials vary considerably, but they do follow certain trends. The use of all-metal construction, for instance, appears to be on the decline. Only four ships, two *Cosmic Winds*, the *Long Midget* and the *Foss Special*, were of that type. Even the LeVier group abandoned that material in reconstructing its *Minnow*. Aside from the fact that few home workshops are equipped for extensive metal work, such construction does not lend itself to the extreme lightness of weight which is so vital in midget racing.

There is a definite trend toward the use of plywood as a covering material. A wood frame wing with plywood covering offers light full cantilever construction with a very smooth surface. Although plywood has been used as a fuselage covering also, it is not favored for that purpose in the current racers. The *Deerfly*, the *Williams Special*, the *Kistler Special* and the *Mercury Air* are all excellent examples of the plywood art.

Although S. J. Wittman still remains at the top with his *Buster* and *Bonzo*, he is the only exponent of the externally braced wing to show such success. Since this type of construction allows the use of thinner airfoils and lends itself better to lightweight construction, it has been widely used in the past. It also is the simplest form of construction for the backyard mechanic to follow. But it is interesting to note that although Bill Brennand won the Goodyear Trophy in a ship of this type, Carl Thompson, who finished last in the Consolation Race, also flew an externally braced midwing design.

High-speed engine operation and propeller design are key factors in Goodyear success. Wittman and LeVier are masters of engine technique and get up to 3,300 rpm out of their stock model Continentals. The LeVier team introduced methyl triptane fuel in the qualifying trials, but gave up its use in deference to the protests of the other pilots. The contest committee ruled that the special fuel was acceptable, but sportsmanship plays a part in these races, too.

Propeller design is of utmost importance, not only in obtaining maximum power through high engine speed, but also in obtaining the proper balance between quick take-off and high straightaway speed. The significance of the getaway and acceleration is emphasized by the fact that many of the ships which burn up the course in their qualifying runs, timed from a flying start, lag miserably in the races which are timed from a standing start.

Steve Wittman brought out the most novel approach to the propeller problem. He has developed a scimitar-shaped wooden air screw of rather high pitch which flexes to a low pitch under the load of take-off. In this way he gets low pitch for acceleration and high pitch for top speed. Wittman has applied for patents on his idea and it may well go as far in light plane practice as his famed spring leaf landing gear has gone.

Just like a good model meet, the Goodyear brings out some unorthodox designs. But again as with models, these usually fail to make an impressive showing. The center of attention at the '49 races was the entry built by the students of Lawrence Tech in Detroit. Looking more like a glider than a racer, it had the engine mounted pusher style between twin tail booms in a pod type of fuselage. Its bicycle landing gear was also novel. The plane finished eighth in the consolation race at 127.964 mph. However, it had a real professional look, and its construction was a credit to the boys who built the ship.

Another excellent example of student workmanship was the Leighnor Special *Mirage* constructed at the University of Wichita about two years ago. Conventional in appearance, it features a can-

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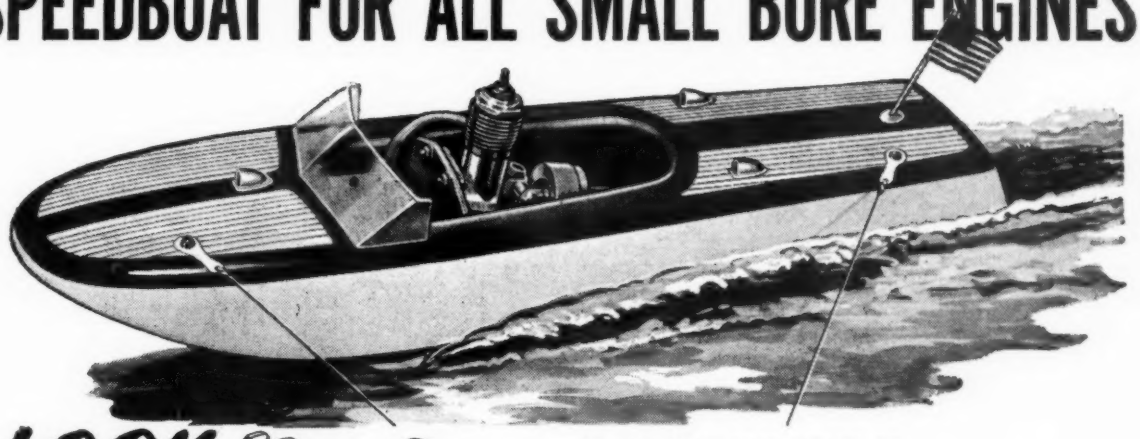

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tilever tapered wing and fabric covered fuselage. Its best speed was 159.4 in the qualifying runs.

It is interesting to note how many of the men who construct these racing planes got their first aeronautical experience with models. In fact, one sees so many similarities between midget racing and our own hobby that we begin to wonder if we have not found in the Goodyear Trophy Race the point at which model building leaves off and full scale aviation begins.

Model Portraiture

(*Continued from page 19*)

The reflectors are made of cardboard formed into cones with the edges nailed between strips of wood on opposite sides of these overlapped edges. Form rectangular pieces of cardboard into cylinders around the light sockets and connect the edges together with gummed paper tape. Fingers of the reflector cone extend along the cylinder and are cemented to it and then covered with gummed tape. Since the sockets are tapered, the reflectors are amply supported when the cardboard cylinders are forced onto them.

Enamel the inside of each reflector white to increase its reflecting power. At least two or three coats; sanding between coats is recommended. The outside of the reflectors, the mounting blocks, the clamp blocks, and the stand bases should be painted flat black to prevent undesirable light reflected from them reaching the lens Don't paint the dowels, or the sliding action of the clamp blocks will be unsatisfactory. Walnut stain can be used on them if desired, however.

Four light stands are preferable, two to throw 400 watts on the background and two to throw 200 watts on the subject. A couple more 50- or 60-watt bulbs on similar stands or in ordinary reflector-equipped desk lamps will be found handy quite often to light up parts of the subject in shadow or to aid in lighting up a dark subject to better advantage.

A simple control panel is a time-saving convenience as background, subject and auxiliary lights can then be individually controlled so that the effect of each set of lights can be observed singly or in combination.

EXPOSURE SLIDE RULE—Correct exposure time can be calculated from the wattage of the lights you use, distance from main light to subject and the stop at which the camera is set. The *Kodak* Home Lighting Guide is good for this purpose. A slide rule that you can make to calculate exposure with greater accuracy is illustrated. It will indicate the required exposure down to ½ and ¼ seconds at the short exposure end of its range.

Such accuracy is not absolutely essential as any exposure has to be increased or decreased at least 100% before the difference in light values can be readily detected in a picture by the average human eye. Nevertheless, it is desirable to know what the *exact* exposure *should* be for comparing results after the pictures are finished if you want to become expert at correct exposure in the shortest possible time and by taking the least possible number of "practice" pictures.

A good method for the first roll or two of film is to take one picture according to the slide rule, one at twice the time indicated and one at half the time. You may discover that your pictures come out consistently best at half way between the indicated exposure and twice the indicated exposure. This may be a characteristic of the camera you use and/or the reflectors, or even the whiteness of the enamel with which you painted them. In that case an exposure factor of 1.5 should be used. How this factor is used will be explained in the part five of this series.

The scales for the slide rule are given in the drawings. They can be cut out and secured to pieces of cardboard. Rubber cement is suitable for this purpose. You can also have them photostated to a larger size if desired. The cardboard pieces are referred to as front, back and slide in the end view. Two filler strips of cardboard complete the parts of the slide rule. The filler strips should be about .005" thicker than the slide to prevent binding. Cement the filler strips between the front and back with about .005" clearance between them and the edge of the slide so the slide can be moved easily. Finish the slide rule by binding the upper and lower edges with gummed paper or scotch tape.

The lighting scales are calculated on the basis of using ordinary light bulbs in white enameled cardboard reflectors, or desk lights with white enameled reflectors. These scales are mounted on the front of the slide rule. The exposure factor scales are mounted on the back and are merely the C and D scales of a Mannheim slide rule. The first exposure factor for which these scales are used is one we will term E x F^1 and results from moving the lens ahead of the infinity position. Ordinarily, unless the distance from subject to lens is less than 8 times the focal length of the lens, increased exposure is not bothered with. By mathematical formula it should be increased any time the lens is moved ahead of infinity position and exposure factors for these conditions are charted on page 54.

If your camera is of a size that uses No. 116 film, the exposure factors of the second row above can be marked on a strip of paper opposite the values on the focusing scale which are indicated in the lower row. The strip of paper can then be secured to the camera bed so that any time the lens is adjusted, the pointer that drops into the focusing scale notches can also indicate E x F^1 for that lens position, without having to refer to a chart. For instance, the 1.1 would be about halfway between the 8- and 10-foot

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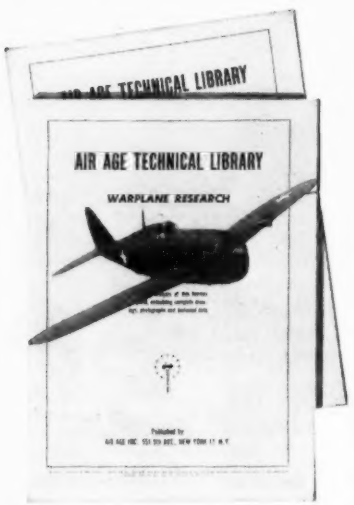

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notches. The 1.2 would be about halfway between the 4- and 5-foot notches and so on. If your lens has a focal length different than 5", the positions of the exposure factors can be calculated by multiplying the upper row of values by the focal length.

Subject-to-lens distance in terms of focal length	22	11	8	6.5	5.5
Exposure Factor ($E \times F^1$)....	1.1	1.2	1.3	1.4	1.5
Subject-to-lens distance in inches if focal length is 5".....110	55	40	32½	27½	

When using supplemented lenses it is usual not to allow additional exposure time, as supplemental lenses between the normal camera lens and the subject do not cut down the light to an appreciable extent. They do cut it down some though and the use of exposure factors is accordingly advisable *for maximum accuracy in comparing results.* Use a factor of about 0.1 for each supplemental lens, that is 1.1 for one lens, 1.2 for two lenses, etc.

Part 5, the last article of this series, will include detailed instructions for the use of the exposure slide rule and will outline all the steps necessary for the making of model portraits by means of the equipment illustrated in Part One and described in Parts Two, Three, and Four.

Flash

(*Continued from page 6*)

$30 million, the completed facility is expected to cost nearly $1 billion. But Secretary of Defense Johnson may cancel the already oft-cancelled project in the interest of economy.

THE HELICOPTER industry may be ready for its first passenger transport version. The various companies are readying plans for passenger-carrying models, but these plans range all the way from artist sketches to nearly-complete prototypes. Bell Aircraft has announced a 13-place feeder-liner version of its basic design but drawings show merely a crowded arrangement of its current helicopter design. Sikorsky is developing a 12-place version of its basic design to be known as the S-55. Piasecki has released sketches of a passenger version of its standard "flying banana" arrangement accommodating 12. None of the companies are willing to risk an all-out effort in the transport helicopter field but want to be ready whenever one of their competitors shows serious signs of production.

SOME OF THE things we have long been told about high altitude being "above the weather" may not be true, according to Gloster test pilot W. A. "Bill" Watterton, who has been conducting *Meteor* test flights up to 50,000'. Watterton reports cumulonimbus clouds as high as 38,000', although they are not "supposed" to exist higher than about 25,000'. He has encountered winds of up to 180 mph and severe turbulence in absolutely clear air above 30,000'. Furthermore, Watterton has run into heavy icing conditions as high as 38,000'. These and other high altitude research may create an entirely new concept of atmospheric conditions at heights of 35-50,000' at which modern jet fighters are operating regularly.

THE LONG "hush hush" Ryan *Firebird* missile has at last been revealed as a small air-to-air design using radar homing on its target. The rocket-powered missile is 7-1/2' long and features cruciform tail surfaces to guide its trajectory. It is mounted under the wing of a fighter plane (four to a plane) and fired by an initial booster rocket which drops off when expended. The flight is then continued on the main rocket in the body of the missile. The warhead is exploded by a proximity fuze so that the missile need only get in the near-vicinity of an enemy plane to insure its destruction. The *Firebird* homes on the radar beams transmitted by the enemy airplane. The XAAM-A-1, as it is technically known, (experimental air-to-air missile, Air Force, model one), is not scheduled for production but is a test vehicle for the development of similar type.

IN WHAT próbably signifies the death knell to the type, the Air Force has cancelled the last of the Northrop *Flying Wing* projects and thus brought to a conclusion the 10-year history of the project (and the 25-year struggle of John K. Northrop for a successful all-wing airplane). It will be recalled that Northrop originally held a contract for 15 *Flying Wing* bombers, 13 B-35 types powered by pusher propellers, and 2 eight-jet versions. The latter two were completed; one crashed to destruction and the other remains in service. Of the 13 B-35 type, 3 were completed and are undergoing flight test. Air Force ordered the remaining 10 modified as jet versions (9 flying and one static test). Air Force has now cancelled all but one of the modified planes. The single airplane is a photo-reconnaissance version of the all-jet B-49 and will be used for tactical training purposes.

AND NOW it's "Junior JATO." Aerojet Engineering Corporation has produced a small 250-lb. thrust version of its famed JATO unit for use on personal aircraft. The bottle is only 6" in diameter, 18" long and weighs 50 lbs. It is attached to simple fittings on the lower fuselage of a Ryan *Navion*, Beech *Bonanza*, etc. The unit is currently being tested on an Army Field Forces L-17B *Navion* and is not yet commercially available. It reduces the take-off of the *Navion* from 875' (to clear a 50-foot obstacle) to only 300'. Oddly enough, the first JATO unit was tested on a personal aircraft, an *Ercoupe* at March Field, Riverside, Calif., early in the war.

THE AIR Navigation Development Board, which last year formulated the long-range and interim requirements for a complete air navigation system for U.S. air ways, recently took the second step in the process of implementing its proposals by assigning three major development projects. The CAA was assigned the task of developing "airport time utilization equipment," which would automatically reserve a landing time at a destination for an airplane about to take off. This would enable the airplane to serve its "delay" on the ground (with the passengers inside the terminal) rather than milling around in a "stack" at some fog-bound airport. The Navy Bureau of Aeronautics was assigned the job of developing "aircraft identification equipment." Since aircraft show up on a radar 'scope simply as a "blip" or dot, it is impossible to identify it individually without asking the pilot to perform some time-taking maneuver observable on the 'scope. The identification equipment would consist of a "transponder" mounted in the airplane. The control tower interrogates the aircraft by a signal which is automatically retransmitted and displayed on the 'scope on the ground. The Air Forces are assigned the task of developing "surface detection equipment" for airport ground control.

THE AUTOMATIC parachute has at last arrived, according to the Irving Air Chute Company, of Great Britain. The chute is operated by a barometric switch which automatically opens the chute when a pre-set altitude is reached. Purpose of the device is to permit pilots of high-altitude fighters to drop to the warmer, more dense air of the lower altitudes before opening the chute. It also prevents an unconscious pilot from failing to open his chute.

WELL, IT was bound to happen sooner or later: a student pilot finally has taken off with his wings folded! But the interesting part of the story is that the airplane actually took off! It happened at the Charleston, R.I., Naval Air Base from which a group of Navy transition student pilots were taking off in Douglas AD-2 *Skyraider* attack planes. The procedure was to taxi to the head of the runway, lower the wings, gun the engine and take-off. The control tower cleared plane after plane when it suddenly noticed one racing down the runway past the point the others had taken off. The big *Skyraider* finally got off the ground after a 2,500-foot run and rose to about 250-foot altitude before rolling over and crash-

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ing into woods adjacent to the runway. Luckily, the student pilot survived. Assuredly this is not the first time such a "Dilbert" mistake has been made but we believe it's the first time a carrier plane ever actually gained altitude with its wings folded!

Wakefield "Surprise"

(*Continued from page* 17)

Make sure to put cement on each rib; pin it properly to prevent buckles. Sand the tips and trailing edges so the covering will lay smoothly, then the wing is finished.

At first glance the wing fairing may look a bit hard to construct, but actually it is very simple. Take your covered wing and pin it in position on the fuselage. Next, fasten the formers to the leading and trailing edges; then cement the uprights from the rib to the outline. To separate the fairing and wing from the fuselage, just cut the outline between the double formers. Cover the fairing with the same material as used on the body.

The prop is actually the most vital part of your model, so if you want good results, carve it neatly, and balance it carefully.

For power, 16 strands of ¼" x 30" T-56 Brown Contest rubber, 48" long, will take you for a long chase. Make sure you lubricate it carefully with a good grade of lube, such as *Jasco*. I used a fuse-type dethermalizer, with the stabilizer popping up to a 45-degree angle. This is the lightest means possible, requiring only a few hooks and rubber bands and, of course, the fuse.

Before using power, try a few hand glides. The model should climb to the right and glide to the left. It will probably need a slight amount of right-thrust and downthrust, but go about adjusting gradually, as you increase power. I'm sure you will be well satisfied with the performance of your *Surprise*.

Remember, it fell only 10½ secs. short of winning the Wakefield, the biggest event of them all !!!

Scrap Box

(*Continued from page* 5)

a Wakefield Eliminations? How come it isn't the oldest boy, or any of the boys who can cement together a couple of sticks? Maybe the writer should practice what he preaches in his own family, but a full-fledged Wakefield would kill the kid's interest. Sure a few Juniors did well at big contests this year. They had their pictures taken. A novelty, obviously. You might tell the writer he is all wet but you'll never tell people like Harry Copeland. Let's give it back to the *boys*.

Enough of this speech making. Before we get slugged, here's a change of pace. The only thing we all agree on is a good story. This month we have a novelty, a chap so modest someone else tells the story for him. Club president Norman Robinson, *ABC Model Club*, Louisville, spies on member Claude Curry, who doesn't like the spotlight. Well, Claude was out one day flying his rubber job. It had a counter-balanced one-blade prop. Before long it had vanished into the blue on one of those out-of-sight flights. Unlike some character who tossed our radio job into his car and made off with it the instant the wheels touched down, the farmer who found Curry's wandering ship was a conscientious man. Getting a card from the farmer to come and get it, Curry was greeted on arrival with these words, "Sorry about that propeller. I spent half a day hunting the other piece."

Maybe that was too sudden? Before you turn off the juice here is another Curryism. After another out-of-sight flight, a woman mailed him his three-foot model crammed into a shoe-box with the note, "Sorry I couldn't find a bigger box." Try your psychology on that one.

Norman, we don't know who should get the free subscription for the best tall but true story of the month, you for the telling or Curry for the doing. Suppose we give it to Claude. If you miss your copy of *Model Airplane News* some month you can always borrow his. Okay, Claude Curry, here's your reward for a story you never told.

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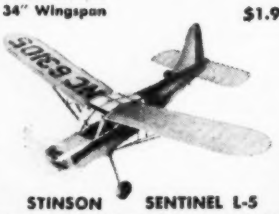

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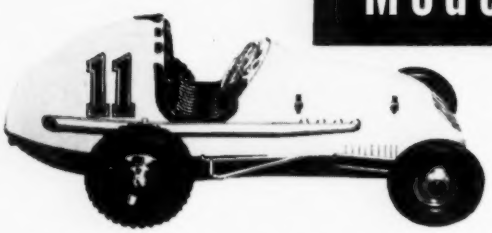


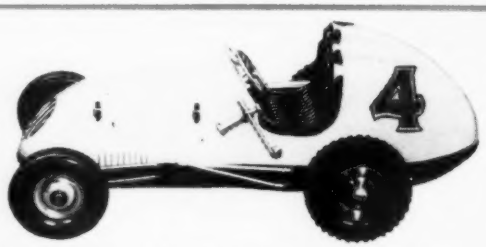
ENCLOSED ENGINE—with driver's seat and steering wheel. Roller bearing crankshaft. Flywheel. Drop forged steel con rod.

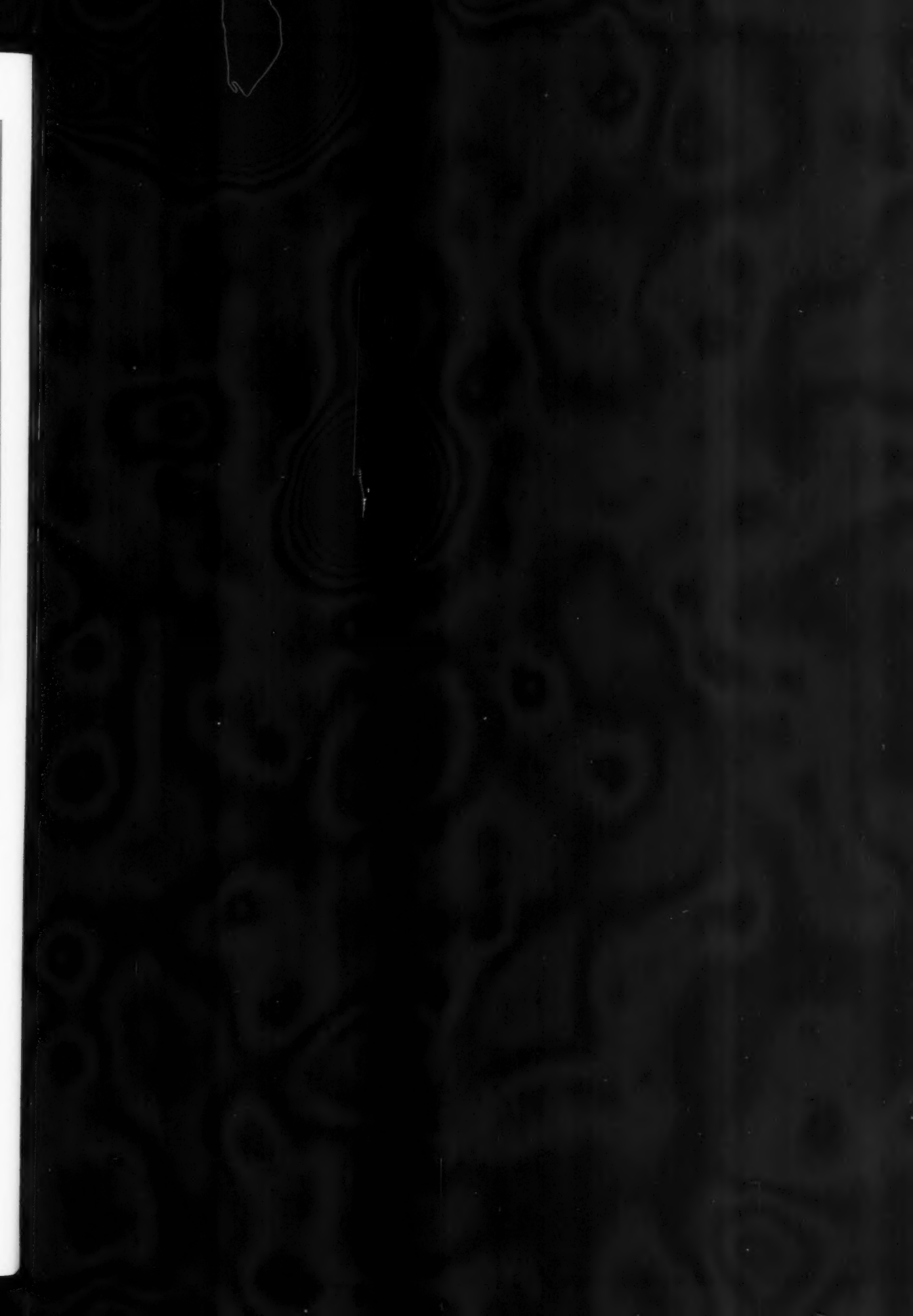
NEW *Realism*

Realistic scale construction—based on the actual car that held No. 1 position at the Los Angeles Gilmore Racing Oval—marks every feature of the new Ohlsson & Rice miniature car! This means performance—durability—satisfaction . . . in a car thousands of *model airplane fans* have been waiting for—a beauty in model midget car realism and performance!

WORLD'S MOST BEAUTIFUL MINIATURE CAR

DIE-CAST ALUMINUM construction. Exclusive front spring suspension and radius rods. Integral gas tank and pressure baffle cooling system.



BAKED ENAMEL FINISH—miniature plated accessories, authentic tread tires, centrifugal action friction clutch. Wheelbase 6". A real racer in miniature!

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